

# **Inclusional Nature**

***Bringing Life and Love to Science***

***By Alan Rayner***

***(First published electronically in 2006)***

***In nature everything is distinct, yet nothing defined into absolute  
independent singleness***

William Wordsworth (1770-1850) from *Guide to the Lakes*

### ***About the Author***

Alan Rayner was born in Nairobi, Kenya in 1950. He obtained BA and PhD degrees in Natural Sciences at King's College, Cambridge and is currently a Reader in Biology at the University of Bath. He is an accomplished biological scientist, ecological philosopher, artist and writer. He has published around 140 scientific articles, 6 scientific books (including *Degrees of Freedom - Living in Dynamic Boundaries*, Imperial College Press, 1997) and a 3 volume e book (*Inclusionality: The Science, Art and Spirituality of Space, Place and Evolution*, 2004). He has contributed to a variety of science- and art-based TV and radio broadcasts and presented many seminars and conference papers as well as convening or co-convening several international conferences and symposia. The latter include a pioneering Science-Art event, '*The Language of Water*', which, in 2001, resulted in an acclaimed BBC Radio 4 series, '*Water Story*', and in 2006 '*Unhooked Thinking*', a landmark in changing our perceptions of addiction. He was President of the British Mycological Society in 1998 and has been a BP Venture Research Fellow and a Miller Visiting Research Professor at the University of California, Berkeley.

## OVERVIEW

This book offers a radical transformation in our understanding of evolutionary processes, giving hope of liberation from currently alienating ideas about human and non-human nature. It describes the author's experiences of pain and joy, strengths and frailties, alongside his quest to make sense of the world in a way that brings together scientific, artistic and spiritual views so that they complement rather than oppose one another. It treats individual consciousness as a vital inclusion of the wider collective realm from which we all emerge and into which we all subside like ripples at the interface of water and air. It may even help us to find more creative, peaceful and environmentally sustainable ways of living together, through a deeper understanding of our natural neighbourhood.

At the heart of the book is a distinctive way of understanding the dynamic geometry of human and non-human nature, based on modern scientific evidence of the inextricability of space from energy, time and matter. This 'inclusional logic' treats all natural form as receptive-responsive flow-form, lacking any fixed executive centre or centres. Correspondingly, space and boundaries are envisaged as connective, reflective and co-creative rather than divisive. They therefore play a vital role in producing varied and dynamic natural form.

This understanding leads in turn to some new and exciting ideas about what it means to be human in a complex, rapidly changing world. These ideas are based on regarding the human 'Self' as a dynamic coupling of inner and outer through intermediary aspects, in much the same way that we can understand a river system as a creative interplay of stream with landscape mediated through its banks and valley sides. Each aspect simultaneously shapes the other.

This form of reasoning makes sense of many long held human emotional values and principles. With it, we can appreciate our complex self-identities as receptive neighbourhoods in dynamic, loving and responsive relationship.

## **PREFACE**

### ***Because of My Singular Inexperience - I am Not an Expert***

#### ***Breakdown or Breakthrough?***

In March 1999, at the age of 49, I packed my bags and ran away from 'home'. A successful biologist, renowned for my work on fungi, I had come to a full stop in my life's second paragraph. I gave in to fears and tensions and declared 'enough is enough - I can't bear this any longer'. I went to see my doctor. He wrote a note saying that I was suffering from 'stress' and recommended that I take time off work. I began 6 months sick leave - as long as was possible before my University Reader's salary would be halved and my career prospects reduced to that of a pensioner, retired early from the field of battle.

My wife, Marion was upset. Only 3 months earlier I had completed my term as President of the British Mycological Society with an address to a capacity audience in Burlington House. This was the headquarters of the Linnean Society where Charles Darwin had delivered his paper on 'The Origin of Species'. My lecture was the culmination of my work in a community of which both my father and father-in-law were esteemed members and through whom I had met Marion - on a fungus foray at Oxford, in 1969. Without warning, I had gone to the doctor and thrown all that to the winds. I had become an evacuated spirit, a shadow of my former self, with very uncertain prospects, living on dreams.

What had brought me to this situation? How was my unhappiness related to my scientific career and personal life? How did I and do I respond to this unhappiness? Could it be a 'blessing in disguise'? Can I see a connection between my inner tensions and conflicts and those of the world I inhabit? Can I see a way in which these tensions and conflicts could be eased or developed more creatively?

“Imagine yourself to be completely alone”. With those words I began “*Degrees of Freedom - Living in Dynamic Boundaries*” (Imperial College Press, 1997), my last conventionally published book prior to this one.

I still feel the ache in those words. An ache that resonates with the desolation of spirit I suspect afflicts so many in the modern world, obsessed as this world is with the *singularity* of the ‘Self’ as an independent individual, dislocated from its neighbourhood and so deprived of love.

### ***What next?***

I asked myself then, and I ask myself now, why should I want to write this book? Looking at other non-fiction books and authors’ prefaces and publishers’ blurbs, I discover more often than not, that the explicit or implicit intention is to transmit the authors’ definitive knowledge to others and in so doing to stake a territorial (and financial) claim as an ‘expert in the field’. More often than not, this claim is supported by a plethora of references paying due homage to previous authority at the same time as establishing the authors’ ‘scholarship credentials’, which entitle them to enter the authoritative circle of power. In this way the knowledge base becomes an ever-enlarging concretion, a clone resistant to change and opaque to insight.

Ah! That’s why I want to write! I want to write because I *don’t* feel like an expert authority, although I do know a lot about my own *experience*, which, in common with many other human beings I feel an irresistible urge to *share*. In that sharing I discover my complex *identity*, my place in the world and community I inhabit and contribute to and belong in. I have a loving sense of *neighbourhood* in which my aloneness (my all oneness) dissolves into delight. A dynamic ontological condition that includes me both from within and from without as distinct but not discrete, inextricably caught up both in and as nested universal flow-form. Simultaneously connecting both somewhere particular (local) and everywhere around (non-local).

I want to write because the more my sense of neighbourhood grows, the more painfully aware I become of vicious cycles of human suffering. I see how these cycles are fed by the expert imposition of abstract, objective, 'either/or' logic, which denies our ability to 'love our neighbourhood as ourselves' and so alienates human nature from our living space. I know about these cycles both from my personal experience of so-called 'obsessive-compulsive disorder' (OCD), which fuelled my flight from my mycological home, and the stories of managerial disaster and human tragedy that emerge relentlessly every day in the news media. I feel that the misery of these stories is compounded by the contextually unaware responses of remote expert authorities, adding insult to injury. Healing isn't possible if context is ignored in order to preserve the powerful, above and outside-it-all status of the authority, which itself contributes to vicious cycles of oppression and counter-oppression.

*If only* we could avoid the compulsion, both individually and collectively, to split ourselves apart from our natural neighbourhood, it seems to me that these vicious cycles could never get going in the first place. I therefore feel that within this compulsion, lies the source of human existential grief and antipathy. So, what, I ask myself, drives this compulsion?

Whenever I am described as an 'expert authority' - as I sometimes am in my varied guises as University Reader, author, ecologist, mycologist and artist - I feel a cold shudder of uncertainty creep up and down my spine. Who am I to claim omniscience? How can I be sure of my knowledge and competence? What in the world can I be certain of?

It is in that cold shudder of uncertainty that I feel not only my deepest sense of frailty but also my greatest affinity with and need for others - my weakest will and strongest passion. Where does this uncertainty come from? Expert authority tells me that I may be unusually sensitive to it, perhaps through a low availability of

serotonin in my brain. Most people, it seems, get through life by trying to eliminate or hide from uncertainty, thereby gaining a 'positive' sense of 'security', 'control', 'success' and triumph of 'good' over 'evil' - a 'feel good factor'. But I suspect that this is no more than 'false positivism', giving a false sense of security, if not a security that is no better than a prison abstracted from real life. I have the feeling that uncertainty is vital to life and creativity and that to try to eliminate or disregard it - as I do *ad nauseam* when caught in an OCD cycle - is deadening. Worse, I suspect our human striving to eliminate it or hide it behind an iron curtain of abstract logic is what makes us kill and abuse one another and despoil our environment, by destroying our natural sense of neighbourhood. If only we could understand it, and collectively hold it tenderly in place, I feel it may be the source of our most profound, loving, respectful and compassionate joy.

So, this book is about my personal quest, with the help of others, to relate scientifically, artistically and psychologically to uncertainty in its many guises. To understand it as a vital, inescapable aspect of our dynamic natural neighbourhood, rather than vainly exclude it. Those who happen to have read my previous book, *Degrees of Freedom*, may detect how my ideas about the dynamic nature of living system boundaries have transformed and diversified. They will find me drawing on a wider and deeper repertoire of personal experience, expression and interests. They will discover that my use of language has changed, becoming even less literal and that I have dared to incorporate my own artwork and poetry into my efforts to communicate what is on my mind, going beyond the limits of what can be expressed in definitive writing. They will sense that my difficulties with conventional neo-Darwinian and thermodynamic explanations of processes of evolutionary change have intensified, leading me to consider that '*contextual transformation*' - the *continual reconfiguration of electromagnetic within gravitational fields* - makes much more sense. They will see that I have become aware of deep cracks in the foundations of abstract mathematical and logical constructs of all kinds. This awareness is what a group of people with whom I have been co-enquiring over the last few years have come



to refer to as '*inclusional*'. It has led us to develop a distinctive form of reasoning or *inclusional logic* that perhaps has much more basis in reality than the rationalistic *impositional logic*, from Aristotelian through Newtonian/Cartesian to Boolean, that has dominated western orthodoxy for millennia.

### ***From Orthodoxy to Heterodoxy***

Orthodox views of uncertainty are evident in the disparaging language used to describe it in one way or another as an *unwarranted intrusion from outside* that lessens our control over and ability to predict nature. 'Error', 'deviation', 'disorder', 'chaos', 'non-linearity', 'noise', 'interference', 'irregularity' and 'imperfection' are just some of the terms used. This usage of language can be traced to the fundamental *cognitive illusion*, which modern science itself could have made us aware of but has not yet acknowledged in its theory or practice.

In our experiencing of nature, we human beings are on the one hand aware of our implicit bodily situation in relation to the gravitational field through our gyroscopic sensing of dynamic balance. This is achieved through the relative movements of our internal organs and within the semicircular canals of our inner ears. On the other hand we can also detect, map and describe explicit local presence through our tactile and visual senses. Hence we come fully equipped to develop our individual consciousness as local expressions of the larger spatial neighbourhood in which we are immersed and of which we are dynamic inclusions, like solutes inextricably in solution with solvent.

Rather than creatively combine these two kinds of sentience, however, we all too commonly split them apart. We may then attempt to select one *or* the other as a superior route to 'truth'.

Correspondingly, the orthodox western philosophical and scientific tradition has been to give precedence to explicit local information, contained in discrete 'objects' or material 'bodies' whilst disregarding immaterial 'space' as 'nothing' -

an 'absence of presence'. Consequently both human beings and other organisms have become regarded as independent, machine-like systems assembled from a genetic blueprint, whose health or 'fitness' is judged in terms of functional 'performance' - productivity, regularity and dependability. Such judgements made in isolation may, however, conflict with the reality of our relational and emotional needs and experience, leading to psychological and physiological 'stress'. By continually attempting to improve human performance against a variety of prescriptive 'norms' without regard to contextual neighbourhood, we may unwittingly damage ourselves mentally, environmentally and physically.

Meanwhile, eastern and mystic traditions have tended to disregard local presence in a quest for spiritual connection with a formless 'everywhere'. This can be experienced through such exercises as yoga and meditation, in which we may lose all sense of bodily boundaries and feel an infinite expansion of 'mind'. We accept space as a 'presence of absence' within which we are gravitationally pooled and dissolved. But in so doing we may lose touch with and even abuse the distinctness of our physical bodies through which we can experience this pooling.

Neither of these traditions on their own informs us adequately about human or evolutionary creativity, and when viewed as somehow being in competition with one another they can give rise to endless, sterile debate, for example about 'nature or nurture', 'individual or group'. Together, however, they enable us to visualize all form as 'flow form,' a variably resistive/accommodative dynamic interfacing of reciprocally transforming convex and concave spatial domains, over all scales from microcosm to macrocosm. In other words we can understand the electromagnetic field - what we perceive as 'light' and 'matter' - as a dynamic inclusion of the gravitational field. Hence we can appreciate our complex self-identities as loving neighbourhoods in dynamic relationship. We can 'love our neighbourhood as ourselves' rather than try in vain to capture the infinite and ineffable within the secure dominion of finite 'ownership'.

## ***Acknowledgements***

Before embarking on the actual 'content' as the 'local expression of context' to which it relates like a river's streams within its catchment basin, I want to thank some other complex selves who have especially helped me to prepare to write this book. In my immediate neighbourhood, my wife, Marion, and daughters, Hazel (and her husband, Rijk) and Philippa, have comforted, tolerated and steadied me as I have negotiated difficult and turbulent passages. Doug Caldwell introduced me to the nucleus of 'friends across the cyberspace' who were to become members of our 'inclusional discussion circle'. Prominent amongst this circle has been Ted Lumley, whose breathtaking speed of response, intensity of writing and breadth and depth of knowledge and understanding has been a mainstay. Lere Shakunle has been a constant companion, since he came across '*Degrees of Freedom*', and alerted me to the possibilities of an 'other' kind of mathematics in which space is a vital inclusion. Jack Whitehead and his network of 'action researchers' have helped profoundly to recognise and develop the educational implications of inclusionality. Helen Haste has helped me to appreciate the psychological implications and spurred me into action to 'write the "Son of Degrees of Freedom"'. Caroline Way, Sandi Bellaart and Ketaki Kushari Dyson helped me begin to liberate my artistic and linguistic explorations. William Pryor spurred me on to immerse my science more fully in the realm of the poetic where I really want it to be. Geoffrey Higgins has engaged me in conversations with many kinds of people I wouldn't normally meet, including members of the business community. Yvonne Aburrow and Chris Jones have greatly facilitated my communications through electronic media. Matthew Peacock helped me to remove some of the rough edges from my typescript. Richard Williams and Ken Masters have strengthened my appreciation of the psychological and sociological relevance of inclusionality. Linda Patterson helped my awareness of unconscious processes, evident in my dreams, paintings and writing style, to surface. Jane Lever helped me to cope with the anxieties arising from these processes and recognise their source. Karen Tesson, Songling Lin and Gina Raihani have trusted and dared enough to include inclusionality in their postgraduate research

inquiries, following in the wake of Zac Watkins and Christian Taylor, especially. I have learned much from students attending my final year undergraduate course on 'Life, Environment and People', who have responded with extraordinary engagement, open-mindedness, creativity and enthusiasm. And I have learned much also from the consternation, misunderstandings and misrepresentations of colleagues and external examiners as they have tried from an orthodox, out of context perspective to assess its place in a scholarly scientific curriculum.

There are also many others who I haven't named here, but am equally grateful to; I'm sure they'll know who they are.

*Alan Rayner*

*Bath*

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**1a. Where Have All the *Flowers* Gone? I. The Vampire Archetype  
and the Desertion of Reality**

## ***Imposing Closure***

I remember in my early teens coming home from school one cold, grey evening, in a despondent mood. I sat in my bedroom staring into the radiance of my gas fire, but feeling neither warmed nor illuminated. An aching void held me immobile and inarticulate. I had masses of homework to do, but there was no way I could contemplate making a start on it. My mother came into the room and asked what was wrong. I shrugged. She left me to it. Perhaps she felt intuitively that I had to negotiate whatever this was, alone. Eventually, to try to get it off my chest, I decided to write down my feelings. A bitter, twisted kind of 'poem' emerged, of which I now recall only the bottom line:

*'The World has Cancer, and the Cancer Cell is Man'*

'Typical teenage angst, shouldn't worry about it, let him grow out of it', might be a typical adult reaction to this bleak conclusion. Indeed, desperately wishing to please my parents and teachers and fulfil their ambitions for me, I did try to grow out of it. I buckled down, jumped lots of exam hurdles that terrified me and eventually obtained a triple first class degree in Natural Sciences at King's College, Cambridge. But this did nothing to relieve the pain and insecurity of the image I had seen in the gas flames that cold, grey evening.

That evening, I understood for the first time that there was a *profound incongruity* between my *experience of living* and what I was being asked to accept in my schooling about the 'way the world works'. And somewhere in that incongruity lay a deadening, dispiriting, *excommunicating* force, capable of sucking the life out of

the Earth and its inhabitants until this force too succumbed to the holocaust of its own making.

My early childhood years, from 1950 to 1958, had been spent in Nairobi, Kenya, apart from a brief summer visit 'on leave' to what to my mind seemed like a wondrously green, cool, luxuriant, rain-freshened oasis called Britain. They weren't easy years. The Mau Mau, a disparate gathering of African 'freedom fighters' or 'terrorists' – depending on your point of view – were an active, sinister presence, delivering violent death to seemingly all around me. A little boy, like me, not far away, was beheaded whilst riding his tricycle - an event that couldn't have helped my mother's terrible anxiety (whose kinship with my own I have only recently fully appreciated, too late for this world, since she died in September 2000) any good at all.

My parents kept loaded revolvers under their pillows. They used them one night, thankfully without effect, when an African 'pole-thief' tried to steal the sheets off my sister's bed, because they thought he was trying to kill her. We had servants in those colonial times, and they lived for reasons I didn't understand in abject conditions in a shack, apart from the main house. One, a man who had always shown me great affection, committed suicide, apparently because he had been told to kill my mother, but preferred to hang himself. My mother was a target because she was a City Councillor, which incidentally took her away from *me* - and had dealings with Jomo Kenyatta, who was years later to become the first President of Independent Kenya. She was Deputy Mayor of Nairobi and due to be Mayor, in 1958, when, almost overnight, we left Kenya and came to stay in Britain, following my father's sudden stroke, which paralysed one side of his body. He recovered, and lived on doggedly until October 2002, despite suffering another stroke, a heart attack and prostate cancer in the intervening 44 years.

Meanwhile, whenever I wasn't confined to bed by the frequent bouts of illness that aroused my mother's concern, I played, generally alone, in the two and a



half-acre garden that surrounded our house. I didn't go to school much until I was nearly seven, but my sister, who was 6 years older than me, taught me about numbers and the alphabet, so I knew a bit about what was to *lie* ahead.

The garden sloped downhill to the River Nairobi that marked its bottom boundary. I used to watch that dirty, brown river, which had a small waterfall at one corner of the garden, with a mixture of fear and wonder as its ever-changing *flow* rippled past. I was told to keep well away from it, because it was inhabited by the bilhartzia parasite, which I imagined was a grotesque old man (Bill Hartzia), hidden within its opacity, who could spring out and devour little boys! Spitting cobras were said to live along the river's margins, and I remember, one day, watching transfixed as the sinuous flow-form of one traversed the water.

Elsewhere in the garden was a chicken run. This was the home of a redoubtable hen called 'Ten Shillings' (because that is what my parents paid to purchase her) who for years and years seemed to lay at least one egg every day, which I would sometimes retrieve still warm from her body to take to the kitchen. I used to chase the chickens and ducks (the guinea fowl and turkeys weren't quite so amenable) until they would relent and tamely accept my embrace. One day I took 'Ten Shillings', tucked under my arm, in to see my mother when she was ill in bed. I had hoped to cheer my mother up, but was greeted not with pleasure but alarm at the *contamination* I was introducing into the house.

At other times I loved to climb trees, until one day, imagining myself to be 'Tarzan', I went too high, a Jacaranda branch broke and I fell, breaking my right arm in three places and coming very close to killing myself. My parents were 'on safari' that day, and so it was my 13-year-old sister who took care of me. She put me to bed, called the doctor to straighten and splint the crooked wreckage of my arm, and soothed the most fearful physical pain I have ever experienced, though not quite as bad as the acute embarrassment I felt at my downfall. That fall also put an end to my short and unhappy time at the local school, and within weeks

we were back in Britain for good, where people told me how lucky I had been to live in such a fabulous place as Kenya. Yes, maybe I was lucky. Maybe.

My joy on returning to Britain, where on that previous short visit I had felt really happy, was tempered by the ever-present threat of mortal illness to my father, by the banishment of my sister to boarding school and by the dingy, grey oppression of London. But in some ways most distressing of all were the following years of confinement to the local prison block known as 'School'.

I can honestly say that apart from the friendships I occasionally found there, I hated School. Its imposed structures and strictures contrasted so strongly with the thrills and perils of my earlier experience in the world of the outdoors, and I longed for release back into that world.

Worst of all were mathematics and certain science lessons, more often than not delivered by loud, aggressive teachers, dedicated to meting out punishment and with zero tolerance for 'error'. To my mind the brutality of these teachers' personas seemed inextricably linked with the reality-denying, soul-destroying abstractions of their subject areas, and it still does. I found it hard not to wobble in the face of their fury, and quickly consolidated a reputation for making 'sloppy mistakes'. And I was not helped from the beginning by my 'slowness' in getting my head around English pounds, shillings and pence, and pounds and ounces, having become accustomed to the decimal system in Kenya.

Second worst was 'religious education', filled as it was with tales of terrible and eternal punishment for 'sin' and lack of 'belief'. A favourite theme of one teacher was that the Cross symbolized 'I' crossed out, with the inference that 'selfishness' was the worst sin of all and had to be eliminated if there was to be any hope of salvation - which in any case there wasn't if you didn't 'believe'. Meanwhile, my profoundly agnostic, relentlessly analytical, perfectionist scientist of a father made it clear that if you did believe in any of these superstitious, evidence-

lacking 'fairy tales', you must be mad! So my choice seemed to me to be between Madness and Hell. Great!

So it was, that these contradictions and abuses closed in around me that cold, grey evening, draining the vitality of the natural world and its inhabitants that I loved and respected. With that closure went my own zest for life.

### ***Excommunication***

For a while, I was lifted out of the doldrums by Biology. Here, at last was a subject that linked me back, at least a little, to my real life experience and yearnings for the wild outdoors. It also linked me back to my father, who seemed so delighted when I began to share in his interests and knowledge, especially in fungi, and even started to show signs of being 'good' at it. I found I had a strong intuitive ability to recognize the 'jizz' of plants and fungi and remember their names, which my father appreciated and encouraged as a complement to his analytical skills and knowledge. We went on 'forays' together, and found a large number of species of *Russula*, a genus of toadstools, that were new to Britain. I began to find a new belief in myself, which carried me through even the trauma of my father's heart attack in 1967, and culminated in my Cambridge degree at his old College.

Then, in 1973, after a year of the postgraduate research into fungal ecology that was the 'reward' for my degree 'success', I painted the picture shown in Figure 1, in which a familiar theme re-emerged.



**Figure 1. 'Arid Confrontation'** (Oil painting on board, by Alan Rayner, 1973). *This painting, made when depressed after a year of postgraduate research, depicts the limitations of the detached view of the observer excommunicated from nature. After a long pilgrimage, access to life is barred from the objective stare by the rigidity of artificial boundaries. A sun composed of semicircle and triangles is caught between straight lines and weeps sundrops into a canalized watercourse. Moonlight, transformed into penetrating shafts of fear encroaches across the night sky above a plain of desolation. Life is withdrawn behind closed doors.*

Looking at this painting, there are some familiar signs of the mechanisms and consequences of objective detachment inherent in orthodox scientific methodology and styles of governance and management.

- The dark figures are 'external observers', isolated from the object of their quest, which they view one-sidedly rather than from all round, from eyes placed on the front of their faces.
- These observers are excommunicated from nature by an artificially imposed, static boundary - a fixed frame of reference - by means of which they can compare what they see going on in their forward view with the position of their own self-centres.
- The canalized water in the gap between subject and object is stationary.
- The world of the excluded observers is a fearful, devitalized wasteland.

So, I was unconsciously recognizing that to regard space as distance between subjects and objects has the effect, when used as *the sole means of perception*, of *schism*, *immobilization* and *abandonment* of loving *relationship*. A picture emerges of bodies as discrete entities, which can only be moved by external force, and whose movements are plotted as trajectories *through* empty space framed by Cartesian co-ordinates in absolute time. Such is the dangerous *misrepresentation of reality* that may arise through objective detachment. A misrepresentation that I think has contributed to profound environmental, psychological and social damage.

Something was happening when I made this painting, which put me back in that fireside chair, aware of an aching void. Something that I now expressed not in poetry, but in the art form I had continued to pursue, to try to keep my balance, since being told both at School and at home to set my course firmly along the

scientific path, following in my father's footsteps. Like so many other young explorers, I was required to make a *choice* between Art and Science, with the distant need for an economically viable career dangled carrot-like and administered stick-like, as the end that justifies the sacrificial means. On the basis of my crude efforts using inferior materials and given restricted time and subject matter, I was told, in no uncertain terms, that I was not good enough at Art. I was therefore required for 'educational reasons' to abandon Art in order to give my full attention to the demands of science and a culture greedy for technology and practicality, and, donkey-like, I followed the lead prescribed for me. But Art was what connected me with my Lost World, and fortunately my close family encouraged me to continue it as a hobby, even suggesting that 'one day, you never know' it might just develop into more than that. Here, now, its unconscious awareness was telling me that something was seriously amiss.

Only a year earlier, exhilarated by my degree success and the learning that had gone into it, I had painted a very different picture, shown in Figure 2, in which my recollection of my childhood in a river-bordered African garden is all too evident.





**Figure 2.** *'Tropical Involvement'* (by Alan Rayner, oil on board, 1972). *This painting depicts the dynamic complexity of living systems. A turbulent river rushes between rock-lined banks from fiery, tiger-striped sunset towards unexpected tranquility where it allows a daffodil to emerge from its shallows. A night-bird follows the stream past intricately interwoven forest towards darkness. A dragonfly luxuriates below a fruit-laden tree, bereft of leaves. Life is wild, wet and full of surprises.*

Looking at this painting, the following features are apparent:

- The imagery is of vibrant, vital, dynamic relationships in which every movement reciprocally changes the shape of spatial possibility for every other movement.
- Everything is intimately involved - reciprocally coupled - with everything else; there is no dislocation of subject from object and the presence of the artist is implicit in the making of the picture.
- There are distinct boundaries and features present, but these are in continual flux, and new possibilities are forever emerging from their interactions in the common space that permeates around, through and within all.
- The water within this common space is not canalized - artificially contained and motionless - but rather is riverine, contained by shifting banks that mediate the dynamic relation between stream and landscape, co-created and co-creative, both shaping and being shaped by the river's flow.

So, what brought about the transformation of this delighted reclamation of my childhood engagement with the natural world into the excommunicated gloom of the painting I made a year later? How might this be related to my fireside feelings on one cold, grey evening, a decade earlier?

### ***The Vampire Archetype***

Up until taking my final exams, I had been in the role of 'learner', which brought a rich variety of joys, fears and frustrations. It brought joys because I was not only being allowed, but actively encouraged to find out and express more about the living world that held such excitement for me. It brought fears because every year, carrying a huge burden of expectation, I was called, alone, to face the



guillotine of an examination system that would mercilessly test my acquisition of knowledge in its own terms, without regard for my human frailties and sensitivities. It brought frustrations, because I was powerless to apply my learning to anything other than the passing of exams, which was of no actual use to anyone. I felt then as I had felt as a child given a toy carpentry set to play with rather than the proper means of doing the job. But now, at last, I was free of the fear of endless examinations and ready to apply myself to the world of my dreams. I was also in love with my wife to be. My joy was unconfined. Briefly.

After such a heady flight, the practical reality of actually doing research - and, on the domestic front, preparing for marriage - came as a severe shock to my system. I quickly realized that with the lack of power inherent in my cultural role as pure recipient of knowledge, came also a lack of the kind of responsibility that comes with actually doing the job. Like many others, I exchanged the burden of expectation (that I would receive and express knowledge well) for the burden of care (that I would use and transmit knowledge well) as I crossed the threshold into adulthood. Meanwhile, I was brought face-to-face with what orthodox scientific inquiry really means. It took me straight back to the prison block I thought I had escaped from.

The subject for my PhD research has always sounded a bit peculiar to me: fungal colonization of hardwood tree stumps. What? You could seriously study tree stumps and get a doctorate for it? Really? Well, yes, actually, you could - and I did! But it would have been nice if it had sounded a bit, well, cleverer (certainly, that's what the Senior Fellows of King's College, Cambridge thought, when they rejected my application for a Junior Fellowship - I was told it couldn't be good enough because they could all understand it!). Ah well!

The rationale for my investigation was that the stumps left in the ground after felling hardwood trees can be colonized by a fungus called *Armillaria*, which may then spread out through the soil and infect and kill neighbouring trees. My role

was therefore to make an ecological study of other fungi that could colonize the stumps and hence compete with and serve as a 'biological control' for *Armillaria*. This appealed to me. It sounded really useful, a practical application of biological knowledge rather than a gratuitous academic quest for such knowledge for its own sake. It also meant spending at least part of my time out amongst the trees and fungi that I loved, and finding new ways of understanding and relating to them.

But when it came to actually doing the work, I came face to face with the *Vampire Archetype*, the force represented by the dark figures in Figure 1. Cloaked beneath what might well be outwardly benign intention (represented in the painting by the Good Shepherd's crook), this, often unconscious, force has the malignant, cancerous potential to suck the life out of life. It does so through a process of *unilateral excommunication* - placing a one-way barrier or filter between itself and the community and living space it inhabits and is nourished by. It uses this barrier as a means of imposing hierarchical (one-sided) *power*, and hence conformity and compliance, upon all outside of itself. It is a *domineering parasite*, a malignant invader rather than a benign off-loader, which transforms the culture it inhabits into a monoculture of itself that ultimately lacks the diversity and complementarity of function to survive as a coherent organization: a culture of the living dead. In a gross inversion of the natural order, it imposes fixed, linear (box-like), uniform structure upon the dynamic, non-uniform, curved-space (i.e. non-linear) primary geometry of nature. In its most explicit and extreme form it is called *fascism*. But actually, it is implicit in *all* forms of orthodox inquiry and analysis, education, religious practice and governance that currently dominate our modern human culture. So, how did I experience it in my PhD research on tree stumps?

In common with many other ecological inquirers, the first 'thing' I became aware of in my PhD research was the yawning 'gap' between the 'field' or 'natural situation' I wished to understand and the 'laboratory' in which I did, or prepared

for, my experimental work. In order to arrive at definitive conclusions, from which predictions could be made, it was necessary to *contain* some part of the natural situation and examine its behaviour under *controlled* conditions in order to *eliminate* the *uncertain variables* of the outside world, which could *interfere* with and *complicate* my analysis.

So, for example, I would collect fungal specimens from the field, *isolate* small pieces of their tissue, grow these under *sterile conditions* in *pure culture* on an *artificial medium* in uniform containers (Petri dishes) kept in darkness in a *constant temperature* 'incubator' where I would *test their performance*. Then, at the end of my experiments I would *autoclave* (destroy) the cultures in order to *prevent contamination*.

The analogy with my own childhood experience of being hoicked out of my natural playground and subjected to someone else's constraints and expectations was inescapable. What hope was there for me then, as a child, imposed upon in this way, to express the full repertoire of my creative potential? What hope was there for me now, as Inquisitor-in-Chief, to appreciate the *varied possibilities* of the life forms I was studying in the full scope of the natural *context* from which I had *dislocated* them? Not much. It was like trying to understand a river from the behaviour of the contents of a cup dipped into it. Whatever certainty and predictability might be gained about the behaviour of the *abstracted contents* came at the cost of increased *uncertainty* about how this behaviour was relevant to the *wider context*. The more I knew about a little, the less I knew about a lot.

To give myself some credit, I was - unlike, it seems, many of my fellow scientists who wish to globalize their limited findings - at least aware of this problem. I made every effort to compare my laboratory findings with - rather than regard them as a predictor of - observations I made in the field, and find insights in the similarities and differences that emerged.

Unfortunately, there was also a problem with my field observations that felt in some ways even worse than my sentencing of the fungi to life imprisonment in the laboratory. Think about it. I was supposed to be studying *tree stumps*! Now, how was I supposed to do that? I couldn't just immerse myself in the forest and wait for the stumps to materialize, and the fungi to colonize them, and somehow see what was going on as a natural matter of course. There wasn't *time* and I didn't have the X-ray vision for that, and besides, tree stumps don't just materialize but are one of the most obvious manifestations of human exploitation of trees. There was nothing else for it. I had to impose my authority on the trees that I loved, in the most violent way possible. With the indispensable help of my assistant, Barry I had to learn to use a chain saw and cut them down in my very own massacre of innocents. Then I would treat the stumps with a variety of chemicals, inoculate them with fungi and sit back to watch them rot. All for the purpose of getting my PhD. For this purpose, I didn't need any old trees or just a few of them. The demands of obtaining statistically significant results, which couldn't just be put down to chance, meant that I needed lots of trees of as uniform a size and age as possible. Hundreds of trees, in fact. I found myself scouring the countryside for suitable candidates to fell. It got so bad that I couldn't look at a stand of trees without imagining how good a crop of stumps they might provide! I even felt excited by the thrill of the chase and the exercising of my masculine will!

It made me feel quite terrible – and still does as I recall it now. All that horror, just to serve my own needs and the purpose of an idea. Alan the Terrible, Destroyer of Woods! Of course I tried to console myself and justify what I was doing using the usual Vampiric psychological platitudes and dislocating devices that put the one-way filter in place. The trees weren't *human* after all - they didn't have *consciousness*! I was really *helping* them by attempting to eliminate the *evil Armillaria* that infected their roots. My intentions were *good*. The trees' sacrifice was for their greater good. The *end justified the means*.

But in the end, my work didn't produce a commercially viable cure for *Armillaria*. That was just pie in the sky, a fool's Grail, approached along a false trail. As it turned out, *Armillaria* was *not* the invariably destructive terrorist of the forest that it had been made out to be - that representation was just a pernicious myth and convenient justification for my swathes of destruction. It actually comprised a highly variable assortment of different forms that play a diverse and important role in the natural energetic economy of woodlands. Only human intervention in this natural economy - of the kind that produces tree stumps and monocultures - disturbs the balance in favour of the more infective forms. As Louis Pasteur, of all people, finally acknowledged on his deathbed: 'the microbe is nothing; the terrain is all'. *Context* is *all*. That important lesson, at least, I did come away with and try to communicate, as I am doing.

Is there something horribly familiar about all this, which reflects the way we human beings are prone to regard and treat ourselves as well as our surroundings and other inhabitants of our living space? Some desperate inconsistency or Orwellian 'doublethink' that accounts for the gruesome excesses of the twentieth century and the tyrannies and terrorism that have heralded the opening of the twenty-first? Which can explain why, even in these supposedly enlightened times, an academic community that vaunts the freedom of its members to 'question and test received wisdom' nonetheless finds certain kinds of enquiries 'beyond the pale' and rejects those that transgress this unwritten rule. How a supposedly dispassionate science, which recognises its provisional nature in an uncertain world and depends for its progress on new discoveries and the proposal and testing of hypotheses, nonetheless 'draws the line' at questioning and changing its methods and logical premises in the light of new findings. Why religious faiths that profess universal love and compassion persecute others that don't share their beliefs. Why business organizations set themselves apart from and aim to exploit and manipulate the needs and desires

of the customers they serve and depend upon. What leads us to believe that environmental interests conflict with social and economic interests. And so on.

As I have already mentioned, at the heart of all this hypocrisy is, I think, the placement of a one-way filter between subject and object, which establishes a hierarchy of power relationships distributed down chains of command from 'top' to 'bottom' in an inversion of the natural order. A hierarchy that dislocates observer from observed, and governor from governed in a way that can only harden the heart and impede the empathic regard of one for the other. A hierarchy that gives human beings dominion over nature, elite human beings authority over common human beings, and an Almighty Authority power over All *below*. A hierarchy of Vampiric ascendancy.

This is not to suggest that all one-way filters are 'bad'. In natural living systems, flow through 'semi-permeable membranes' can bring vital *temporary* benefits by enabling growth and redistribution of resources from one place to another, as in the metamorphosis of a caterpillar into a butterfly, where local death feeds new and continuing life. If flows occur *exclusively* through one-way filters, however, they cannot be other than unsustainable, culminating in a process whereby life feeds global death. It is vital, therefore, that such flows should not be given primacy of place in human societal endeavours, as they currently are.

In natural living systems, this potentially cancerous hegemony, or dominance of flows through one-way filters can be counteracted in two contrasting ways whose potentially complex interaction led to my focus on 'dynamic boundaries'. This focus turns out to be the most significant, and unanticipated, issue from my PhD research. One way of preventing one-way flows naturally is to close down or seal the 'gaps' or 'communication channels' through which flow is sustained. A familiar example is the formation of a corky 'abscission zone' at the base of leaves about to fall at the end of their productive life. Conversely, in other circumstances, gaps or channels are opened up making *both* inflow and outflow possible. This occurs,

for example, when the membranes between two adjacent cells coalesce to form a 'communicating junction' - a *vital* feature of all multicellular organisms, including human beings.

The contextual circumstances of *when and where* these boundary-opening and boundary-closing processes take place are critical to whether they will aggravate or alleviate the Vampiric potential. The problem for us human beings is that due to a fundamental *incongruity* between our orthodox, rationalistic *logic* and our emotional *feelings*, we are prone to get the space-timing utterly out of synch and so aggravate the Vampiric potential. Essentially, we are prone to allow our misplaced anger to close doors (boundaries) when we need to be opening them, and allow our misplaced loyalty to open doors when we need to be closing them. We do this because of an abstract view of space and boundaries. This view leads us to reason from an illusory premise that imposes discrete limits and supposes infinite unrestricted space, neither of which can exist in a dynamically featured world and Universe. How could we have got ourselves so inextricably caught up in such an illusion? Why do we find it so difficult to escape from it? What kind of *addiction* is it that so rewards and traps us, turning us, ultimately, *against* ourselves?

### ***A Cognitive Illusion***

So, how did I perceive the trees as I strode purposefully towards them, chainsaw at the ready? How might this perception have contrasted with my childhood experience of trees that led ultimately to my downfall from the jacaranda?

Before you answer, I invite you to ask yourself - and anyone else within range - *what is a tree?*

Three interesting observations may arise from asking this question:

1. It is surprisingly difficult to provide simple answers for such simple questions – the underlying issues are far more complex than first meets the eye.
2. Different people are liable to provide very different responses to the question, reflecting their unique situational perspectives and experience. Rather than ‘argue the toss’ over which answer is ‘best’, a much richer understanding of the nature of trees may be gained by bringing the full diversity of the responses together in a common focus.
3. Most, if not all the responses are likely to attempt to *define* a tree as ‘something out there’, reflecting our habitual tendency to perceive our surroundings in terms of *solid objects*. Yet each definition has the effect of closing down the possibilities of being a tree and is insufficient, in itself, to describe the ‘big picture’.

I know that when I strode purposefully towards the trees during my PhD, I saw them as row upon row of big sticks in the ground! And very hard and solid sticks at that, which would leave me coming away very much the worse for wear if I happened to bump into one inadvertently.

How very different this was from my childhood perception! Then I saw them as *welcoming places*, with branches outstretched like arms, ready to lift me up into the nurturing mystery of their labyrinthine inner spaces. Then they were *attractors* and I ran joyfully into their embrace, as I might to my mother’s bosom. They never let me down until one day, wishing to emulate an adult male hero figure, and be not a boy but a man, I set my heart on *conquest*, reached too high towards the sky and ended up crying like a baby!

How could this change in perception between childhood and adulthood occur?



Before you answer, I invite you to sit down in a chair, and to stare fixedly at your knee. Now, still staring, stroke your knee with your fingers. Now, continue stroking, but close your eyes. Do you notice a change in your perception of your knee?

You might have noticed a tendency to 'flip' from a detached, insensitive objectification of your knee as though it was 'out there' somehow dislocated from you, to a *feeling awareness* of its presence as a subtly textured aspect of yourself *enveloped in* rather than *isolated by* space. Whilst our eyesight helps us to differentiate one thing from another and so catch or grasp 'objects' and avoid obstacles, this demonstrates how it also has a detaching effect. It makes (air-) space seem like a separating distance of 'nothingness' rather than a 'pool' in which we are immersed. When we close our eyes, we *feel* the invisible *presence of absence* (space) close around and within us rather than *see* (or rather, fail to see) the *absence of presence* that comes between material objects.

As a corollary to this exercise, imagine air was water or, like a sheep or rabbit that you have eyes on the side of your head, giving panoramic rather than binocular vision. Might this change your perception of your surroundings and of yourself in relation to them? Might you be less inclined to distinguish 'something' from 'nothing' and regard the latter as empty 'distance'? Try holding your arms out straight in front of you. Then, keeping your eyes fixed on your hands, move your arms apart until your body takes the form of a cross. Do you feel a growing sense of your own inclusion in space and a softening of edges?

It seems to me that as we switch roles from being receivers to providers of sustenance and protection in the transition from childhood to adulthood, especially as hunter-gatherer-warrior males, so we come to rely more and more on our boundary-hardening, object-defining eyesight to learn about the world around us. By the same token, we allow our other senses to diminish, along with our emotional responses. In this way we literally *lose touch* with reality, whilst

claiming ironically to have a greater *grip* on it, as we strive for *independence*. No wonder our teens are angst-filled as our lives become increasingly isolated and desolated, with the only prospect of relief coming in the form of the dynamic coupling of sexual re-combination!

*I must emphasize at this point, however, that I don't think that there is anything intrinsically 'wrong' with this blinkered vision:* it has played and no doubt can continue to play a vital role in humanity's survival and accomplishments. It has its place. The problem comes when it grows *out of place* and gets used *exclusively* as our *sole* basis for understanding nature and ourselves. When it becomes so embedded and taken for granted in our systems of reasoning, governance and education that we don't even notice. Then it becomes a cancerous expression of the Vampire Archetype and we end up hurting ourselves, just as I did when I fell down that Jacaranda tree.

This blinkered perspective of a world divided absolutely between *something* and *nothing* (matter and space) establishes the following cascade of deductive logic:

1. It becomes logical to regard - and hence disregard - 'space' as the 'absence of presence', which surrounds and thereby both isolates and is isolated from the definitive 'things' or 'solid, tangible material bodies' that really 'count'. The resulting rationalistic logic of 'things' founded on an *initial premise* of *independence* or *discreteness* is sometimes known as the 'law of the excluded middle'. The latter holds that 'everything is either A or not-A'. It features in logical systems ranging from that of Parmenides, which was compounded by Aristotle, consolidated in the 'dualism' of Descartes and incorporated in the 'Enlightened' science of Newton and Bacon. It was also rendered into George Boole's binary system as expressed in digital computers and appears in many modern-day derivatives.

2. From this perspective, there is a natural predisposition to comprehend the world primarily in terms of *quantifiable contents abstracted from their spatial context*.
3. With the emphasis now firmly on these material contents, the question of their composition focuses on what they could ultimately and irreducibly be divided down into, and from what is the material world therefore reconstructed.
4. Such reduction to 'infinitesimal singularities', 'monads' or 'point masses', with all space excluded, is the basis for atomism and remains at the heart of orthodox scientific and mathematical logic to this day. Even many so-called 'continuous' mathematical models rely on this reduction to infinitesimal discrete intervals/components.

However, for all the inventiveness of science and its development of sophisticated microscopic and telescopic tools, no evidence has been found for the existence of the 'solid massy particles' envisaged by Democritus and Newton. Although there *is* evidence for *distinct* atomic and sub-atomic *domains*, space, as a resistance-less *presence of absence*, has so far been found to *permeate everywhere*, from microcosm to macrocosm. Science itself has therefore found solidity to be an illusion, but, notwithstanding the advent of relativity, quantum mechanics and non-linear theory, has not as yet adequately assimilated this finding into its theory or practice.

There is *no evidence* for the existence of a *fully* discrete limit, or for its counterpart, infinite *unrestricted* space, anywhere in the 'known' Universe. All theories and concepts constructed from a logical premise of absolute discreteness, no matter how elaborate or sophisticated, are built on brittle foundations. All logical systems, based on this premise are *impositional* in that they *impose discrete limits* for which there is no evidence in reality. Moreover, they are *supernatural*, in that they *superimpose* mythical fixed structure, which

has the effect of inverting natural power relationships and so giving rise to Vampiric hierarchy.

To return to the question of ‘what is a tree?’ Our scientific investigations of trees have revealed them to comprise a nested series of *holes*, from those amongst and around the branches, to those amongst and within the cells of leafy and woody tissues, to those amongst and within the atomic structure. Geometrically, then, a tree comprises a dynamic *nested holeyness* of outer and inner spaces with permeable boundaries. As I will discuss later, this geometry corresponds closely but not *entirely* with what modern mathematicians call ‘fractal’ geometry. By thinking of a tree as a *place*, both enveloped in and enveloping other places, we can mentally picture this nested holeyness and the coupled inner and outer dimensions of the tree as a complex togetherness of inner with outer space.

So, my childhood perception of the welcoming ‘attractor space’ is more in accordance with modern scientific evidence than my ‘adulterated perception’ of ‘solid objects’ defined by a blinkered perspective of the kind that gave rise to the modernism emerging from the Enlightenment and Scientific Revolution. The latter, in a sense, actually made us *see through dark glasses*, quite the reverse of helping us to ‘see the light’ at the dawning of our intellectual adulthood. Instead they diminish both the sensitivity and implicit natural understanding gained in the innocence of our early years, which persist in aboriginal cultures. They dislocate us from the space that connects us. Detached from the possibility space of the imagination, the ‘Dream of (Pure, Rationalistic) Reason’ does indeed ‘Bring Forth Monsters’, as so vividly depicted in Goya’s print. The intoxicating, addictive, controlling power allocated to the definitive, ‘individual’, inner-centred aspect of our Self grew, self-servingly, out of all proportion. We became arrogant in imposing our limited, pure knowledge-seeking perspective on the world and ascended Vampirically, like me up that Jacaranda tree, ready to repeat that Original Fall from the Realm of *Flowers* described in Genesis.

The Dream Project of Rationalism is Monstrous. We can only in-line we cannot out-line the ineffable. The 'local' cannot assume dominion over the 'non-local'. The finite cannot circumscribe the infinite, much as egotism might desire that it should.

**1b. Where Have All the *Flowers* Gone? II. Dividing Lines,  
Numbing Numbers and the Spread of Anti-Culture**

## ***Dividing Lines***

So, what do the sharp, severing lines dividing the worlds of inflorescent abundance and deserted scarcity in Figure 1 symbolize? I think it is the *flatland perspective* of classical Euclidean geometry, which arises in turn from the illusion of solidity coming from our binocular vision and terrestrial lifestyle. It is these brutal, space-excluding demarcations of orthodox, impositional logic, which to this day expel us from a dynamic, 'both-and', flow-form world of inseparable complementary potentials, into the nightmare of 'either-or' fixed opposites interminably in dispute with one another. We Fall from a world of complementarity into a world of adversity, in which difference becomes a bone of contention - a source of shame and blame that we must try to conceal, annul or exclude, rather than a cause for celebration. We set good against evil, right against wrong, light against dark, something against nothing, one against other, positive against negative, nature against nurture, mind against matter etc, and lose our common sensibility in the cross-fire.

This is the shattered 'reality' that emerges when space is cast out from nature. This is the 'reality' that my unconscious awareness first sensed in the geometric abstractions of the schoolroom. How on Earth could those simple constructions of straight lines and circles relate to the wonder of the trees that I climbed, the turbulent river that I watched and the rippling sinuosity of the cobra that fascinated me, as I experienced the adventure playground of my childhood?

How many of us have reacted with incredulity on our first encounter as children with the dimensionless points, widthless lines, depthless planes and impenetrable solids of Euclidean geometry? What is this simplistic, supernatural nonsense that these patronizing adults are talking down to us about, why do they assume that we can't handle anything more complex? What kind of geometry is it, really?

A moment's reflection reveals that this is the geometry of pure matter from which space has been excluded, one which makes no sense whatsoever in relation to the natural world of our experience. How, in this space-less construction is one supposed to bridge the gap between points, lines, planes and solids? How can a dimensionless point, or set of points, be spread out or aggregated into a line? How can a widthless line or set of lines make a plane? It just doesn't add up. Yet here lies the geometrical foundation of virtually all our modern mathematical systems. An abstraction that can't relate to reality, which, when supernaturally imposed on reality can only create incongruity.

There are, in this abstraction all the signs of obsessive perfectionism. A perfectionism that attempts to purify hard, dependable, knowable matter from the contaminating presence, like Ten Shillings the Chicken, of space as a fearful, unwarranted intrusion from outside, a source of uncertainty and irregularity. And, by all accounts, such perfectionism or idealism was very much in the minds of those ancient Greek philosophers and mathematicians, who felt that the Divine could surely not be subject to 'outside interference', only capable of imposing it.

So, Euclidean geometry was actually abstracted as 'Divine Geometry', earthly departures from which were perceived as symptomatic of a Fallen World. Intrusive space was hence cast in the mould of the 'imperfection', 'contamination' or 'Original Sin' that afflicted ordinary mortals. Yet, ironically, as I have suggested, it may be the very denial of the vital presence of spatial possibility that is most likely to lead to our downfall as we aspire to such distanced, Vampiric, Divinity. The exclusion of space from matter renders matter concrete and so dependent on purely external force, ultimately applied by a Divine Mover placed somewhere ineffable, in order to move or be moved from its state of rest or uniform motion. So, the default condition of Euclidean geometry and the associated discreteness or independence of material bodies, is stasis. Our much-vaunted *freedom* comes with the *inability to move* of our own free will. Such is the brain-curdling doublethink of abstractive perfectionism.



Here lies, I think, the fundamental problem in the orthodox perfectionism of both reductive and holistic definition. This is the division down or multiplication up into pure, space-excluding, finite 'units', 'parts' (sub-wholes) and 'wholes', which are then regarded either as the independent 'building blocks' of nature or nature itself as an independent entirety. In this process, the spatial coherence or inner-outer togetherness that is intrinsic to our dynamic nature is mentally severed or dislocated, and cannot be regained by subsequent reconstruction. Poor old Humpty Dumpty cannot be reassembled, once his dynamic boundary, through which his inner and outer space are reciprocally coupled, is shattered. Neither can he be born without this boundary in place, informing his vital inner space.

When we look from this discretely bounded viewpoint at the Universal sea, and see its capacity to manifest itself in distinct flow-form features, from quarks to galaxies, our tendency has been to regard these flow-forms as isolated components rather than relational expressions of the Universe. By disregarding the necessary *connective space*, we have confused the explicit *derivatives* or *products* with the *ingredients* of nature. It is like perceiving waves in the sea and concluding that the sea is *entirely* composed of waves. And saying that buildings are constructed from bricks, whilst forgetting that the bricks were first *moulded* through the *bringing together* of earth-water with air-fire in a local spatial context.

The Derivative/Product is not the Ingredient, but rather the togetherness of ingredients, most fundamentally the 'Divine Couple' of electromagnetic field ('light' - the responsive, symbolically 'male' aspect) as a dynamic inclusion of gravitational field ('darkness' - the receptive, symbolically 'female' aspect) in reciprocal relationship. Sea waves are local manifestations of seawater dynamically coupled with air; the sea cannot be purely or entirely a set of water Waves. Quarks are local manifestations of the Universe (the togetherness of electromagnetic field within gravitational field everywhere); the Universe cannot be made entirely of quarks. Individuals are local manifestations of populations

(the togetherness of one with other); populations are not composed entirely of individuals. Trees are local manifestations of forest (the togetherness of plants with their living space); forests are not made entirely of trees. The Self (togetherness of inner with outer) manifests the individual; the individual does not constitute the entire Self. Localities emerge from non-locality; non-locality is not assembled from discrete localities. Places are made of everywhere; Everywhere is not an assembly of places. Context is All, Space Included. Content is a local expression of Context. There are no discrete objects, only flow-form features.

To treat lines (and planes) as '*flatlines*', as definitive, space-excluding boundaries that sever one thing absolutely from another is hence the ultimate desertion of reality. It is the fallacy of the excluded middle, by which we have become bewitched and that we reify in our language and mathematics of 'things' as 'objects'. 'Drawing the Line' has become synonymous with our requirement to ignore spatial context in order to impose discrete categories and abstract rules, ending in what can often be cruel, unfair or unrealistic judgements. The line becomes regarded as a barrier or fence that we mustn't sit upon, for fear of severance or falling between two stools. False dichotomies of either/or are then imposed. These false dichotomies are shown up by what might well be thought of as the Godmother of All Paradoxes: The Cretan Liar Paradox, in which a Cretan informs you that all Cretans are liars.

The problem arises through assuming the *completeness* (wholeness) and consequent *independence* and *self-reference* of a statement which actually can only be relative *to* another outside of itself. Kurt Gödel, in 1931, showed how this problem affected all classical mathematical 'proofs'. Nonetheless, the seductive convenience of drawing discrete lines continues to hold sway over modern thinking. Even those who are aware of the paradoxes and inconsistencies of this practice are prepared to tolerate them, unwilling to relinquish it in the face of its apparent strength and foundational location. It is therefore sustained by extremely powerful peer pressure. So we carry on conflicting with ourselves.

Do we have to treat lines this way? Is there *another* way, more in tune with the dynamic reality of nature that expresses us as we reciprocally express it? For a glimpse of this possibility, try the following exercise.

Find a suitably thick-rimmed coin - for example, a British pound coin - and ask yourself to choose 'heads' or 'tails'. Having made a choice, toss the coin in a spinning arc and catch it. Now, place the coin carefully on its edge on a flat surface. Tell yourself, 'I was right and I was wrong', and give the coin a nudge to set it rolling.

What, if anything, does this exercise reveal to you about the nature of evolutionary process? Here are some suggestions.

1. The coin toss is both an extremely familiar metaphor and actual method for making a decision, and assigning the likelihood of particular outcomes (statistical probabilities), in the face of an uncertain 'future'. It is the basis both for imposing closure and for assessing risk as accurately as possible prior to taking a gamble. And it is a metaphor also for adversarial debate - 'arguing the toss' - and 'winning' or 'losing'.
2. But the decision rests on there being only two possible outcomes, each one of which excludes the other and once arrived at is terminal in the absence of intervention by external force.
3. For this to be so, a third possibility, which holds the other two dynamically and reciprocally together, must be excluded. It is excluded by reducing it to 'zero' - removing all space from it, so that the coin has no width/depth, like a Euclidean line or plane, severed from its neighbourhood. The coin, deprived of its inner, outer and intermediary aspects, is then compelled to lie, like a Cretan, one way or the other on the flat space on which it is superimposed.

4. If this third possibility is retained, however, the coin can continue to roll in a never-ending non-linear, curved space exploration and expression of the topography of its context.
5. Hence it can be seen that the 'heads' or 'tails' choice is the product of an imposition that ignores the role of spatial-inclusion in the roll of the coin itself, and so renders the coin bipolar, a divided self.

Now, find a sheet of paper, say about 30 cm x 20 cm, and gripping each end of this between your fingers, hold it out in front of you. Say to yourself, and to anyone else watching, 'here is a uniform Oneness; how can Two emerge from this One?' Now, fold the paper in half and press with finger and thumb along the length of the fold to introduce some local stiffening. Now, using the stiffening in the paper as a pivot, push one half towards the other half, first one way and then the other. Notice what happens. Now, tear the paper along the line of the fold and consider the consequences of this action.

Here, the sheet of paper, encircled within your outstretched arms and body, represents the *coherence* of energy-space or 'natural presence' that *differentiates* or 'multiplies by subdividing' to produce a 'twosome' or *dynamic couple*. But this twosome is simultaneously a 'threesome' because it includes the fold/boundary/interface/stiffening, which itself is but a local derivative, formed through the in-folding of the original, non-local 'Oneness'. The couple is therefore a 'Three-in-oneness', a 'qua-ternary' flow-form, in which the 'dance' of 'one' is reciprocated by the 'other' in a dynamically balancing, gyroscopic relationship. This reciprocal movement of one with the other pivots around their mutual interface, in much the same way that the 'heads' and 'tails' of the rolling coin relate reciprocally through the thickness that expresses them both and is itself but a local derivative of everywhere, within and without the coin.

The tearing of the paper represents 'excluding the middle' by treating the fold as a discrete limit rather than a pivotal place of coupling. The flow-form collapses; each 'side' is dislocated from the other and their relationship switches from complementary to adversarial. The qua-ternary 'one-with-other' is converted to binary one-or-other and ultimately to unitary one-without-other if a selection is made. Only 'sellotape' can now repair the damage and restore *some* (but not all) of the coherence of the original dynamic relationship!

So, by regarding the line as a pivotal place, a co-created, co-creative dynamic boundary, including space, the possibilities of the enabling potentials can be maintained. Evolution can continue rather than collapse into the stasis of one or other, an either/or choice. The dynamic relationship of *out-lined* 'figure' and *in-lined* 'ground', so well recognized in Art, but ignored by orthodox science, can continue to dance, mediated through their interface.

### ***Back to Basics***

How on Earth, you might be wondering, did I come to be thinking about such things, from my lowly studies of tree stumps? Well, actually it was another case of 'I came, I saw, I conquered' (coincidentally, I was born on 26<sup>th</sup> July, delivered by Caesarean *Section* and I have been 'stabbed in the back' by supposedly close friends quite a few times)!

Having felled the trees and left their severed remains to rot, the moment arrived for me to find out how the fungi had been performing. I did this by sawing the stumps into a series of sections and looking at the patterns of decay therein. I immediately saw the characteristic feature of decaying wood that has variously been described as 'zone lines' or 'demarcation lines'. The latter take the form of narrow, dark or coloured zones between adjacent regions of decay, giving the cut surface of the wood a mosaic or map-like appearance.

I became interested in a particular kind of 'zone line', which produced something that as far as I know had not previously been reported, when I incubated the stump sections by wrapping them in moist newspaper in polythene bags, so that the inhabitant fungi would grow out and reveal themselves. Out of these zones grew a characteristic variety of dark-coloured fungi known to the cognoscenti as dematiaceous Hyphomycetes. When I isolated fungal colonies from the decay regions on either side of these dark zones, I found that they were genetically different 'strains' of the same species of decay fungus. These strains exhibited what looked like an antagonistic response, akin to an immune rejection response, when they encountered one another. So, the dematiaceous Hyphomycetes were like 'Poppies in Flanders', inhabiting the no-man's land between warring neighbours fighting for territorial supremacy. Or so I thought.

Fungal colonies consist of minute tubes, called 'hyphae', which grow at their tips and can branch and fuse with one another to form a collective system or 'network', known as a 'mycelium', from which fruit bodies like mushrooms can emerge and disperse 'spores'. I got very excited about my finding, because the prevailing, authoritative view at the time was that if genetically different colonies of the same species of decay fungus met in their natural habitat they would fuse together to form a functionally integrated 'unit mycelium'. This profoundly 'holistic' view had impeded the development of 'fungal population biology' as a distinctive field of study for many years; now my lowly research (which, as it turned out, was not entirely without precedent) appeared to have 'falsified' it, opening the way for new vistas of inquiry.

All this happened when Richard Dawkins' now famous, and notorious book, 'The Selfish Gene' was all the rage. This book consolidated the idea that the gene was the ultimate discrete, particulate 'unit of selection' needed for neo-Darwinian evolutionary theory to work. Herein was the definitive 'solid object' that could be subjected to the external force-filter of 'natural selection' to bring about

evolutionary change. As such, the gene was identifiable as the 'central controller' and 'determinant' of the 'self'. Its evolutionary need was to survive at all cost, in whatever way possible as it replicated and spread itself like cancer through the temporary conveyances of organisms, cells, bodies, populations and communities.

My finding seemed to fit perfectly with this Vampiric, 'selfish gene' notion. Fungal populations, which formerly had been thought of as a socialistic mush, a kind of fungal 'welfare state', really did consist, after all, of dissociated individuals whose self-identity was determined by their genetic differences. When these individuals met, the inevitable result was conflict.

I hovered on the brink of joining the evolutionary hard-liners, whose 'grown-up' view of nature was of a heartless struggle for supremacy. This was at variance both with my childhood view and with the moral principles and compassionate values I had been brought up to cherish as a member of the human community.

The temptation to join the hard-liners was strong. By joining them, I knew that my scientific credibility, respectability and reputation would grow. With my dear, departed colleague, Norman Todd (he died, aged 42, in 1985, following an asthma attack), a geneticist who, like my father, valued my intuitive ways and knew how to alleviate my anxiety, I wrote a string of hard-line articles about 'Fungal Individualism'. As I did this, however, I began to feel, growing within myself, an uncomfortable, deeply jealous sense of territorial ownership over the field of 'fungal territoriality'. This made me fearful of others' claims and findings, which could be interpreted as competitive rather than complementary and supportive of my own. It also made me fearful of my own findings, and capacity for error, which might undermine the case I was putting together. Intrusive self-doubts followed, leading to endless rounds of tortured, compulsive checking. Ultimately, after many intervening years of struggle, I couldn't sustain my imagined claim to fame any longer. I let it go and waved farewell, at least

temporarily, to mycological research. But this 'ending', as it turned out, was my 'opening' into the enquiries described in this book.

From the outset, I was aware that things weren't quite as simple as they first seemed, nor as simple as I would have liked them to be, or others seemed to want me to say that they were. To begin with, the lines of demarcation weren't absolutely hard and fast. They varied in width and intensity, depending on which strains were combined, on the circumstances in which they were grown and on the phase of development they were at. In other words, context is all-important in the expression of the rejection reaction, largely, as I was to apprehend years later, through the mediating role of oxygen and its influence on cell function and boundaries.

Then sex reared its ugly (or beautiful, depending on the mind of the beholder) head! How wonderfully contrary to our 'everyday' distancing from one another the process of sexual coming together is! No wonder it gives neo-Darwinian thinkers obsessed with the selfish needs of definitive individuals and their genetic controllers, such a hard time to understand!

In the fungi I was studying, the contrary tendencies for genetically different forms to 'come together' for sex whilst bodily repelling one another in other phases of their lives was especially evident. It could result in some very complex and subtle interplay in their interactions with one another.

It became clear to me that the tendency to reject 'other' and form a demarcation zone could be overridden by a sexually accepting response, and that the balance between these differing tendencies could be very sensitive indeed. This had important implications for the origin of distinct species. My research companions and I found that behaviour within populations inhabiting a common geographical region tended to be quite sharply distinguished between somatic rejection and sexual acceptance. By contrast, interactions between strains from different



regions, which wouldn't normally occur in nature, could be complex, one-sided, degenerative and yield a rich variety of distinctive forms. Obviously the processes of opening up and closing down boundaries to 'other' were not absolute, and could also produce much creative tension.

These observations led me to revise my initial hard-line interpretations, and see the rejection responses in a different light. Rather than being an expression of *opposition*, I think they are more aptly understood as the manifestation of *resistance* or *stiffening* in the medium of their common space. They are like sandbanks precipitated at the interface of distinctive tidal flows or a fold in a paper sheet. They therefore have the effect of *expressing* and *preserving* the *local identity* at the individual level that sustains the *diversity* at the population level, which sexual re-combination both derives from and sustains. Moreover, I think that they are expressed naturally as the *phase interference* that results when genetically disparate nuclei and mitochondria (respectively the main store of genetic material and the local bodies or 'organelles' through which respiration occurs) are mixed in the same cellular context. This interference gives rise to an 'oxidative crisis', leading to the degradation of genetic material and ultimately to the death of the cell. It can be prevented, however, by insulating cell boundaries with materials that resist access of oxygen from outside to inside the cell. These materials, which include the dark pigment, melanin, are characteristic of all kinds of 'zygotic' cells and tissues that contain genetic material derived from distinctive parents.

As I argued back in the 1990s, 'safe sex' is necessarily 'protected' sex, because it requires the restriction of access of oxygen to the cell interior. As well as being the 'supporter of combustion' through which most organisms produce chemical energy during respiration, oxygen is capable of producing highly reactive, potentially disruptive, 'free radicals' and 'reactive oxygen species' in the process of being 'reduced' to water.

Here, then, we see a natural expression of combined 'love' and 'respect' for 'other', mediated through the opening and closing of territorial boundaries in relation to context. The preservation of local self-identity opens and sustains the global possibility for co-creative, complementary, diversity. By contrast, our social misfortune as human beings, arising from the imposition of orthodox logic, is that we have been prone to misplace our anger and affections in ways that promote conformity at the expense of complementarity. We have hence served an abusive potential rather than the compassionate spirit of humanity.

### ***Numbing Numbers***

Amongst the many rejections I received whilst attempting to publish the findings of years of work on fungal interactions was one that implies 'the journal does not wish to publish *mere observations*, it requires quantitative data - numbers!' This remark was occasioned by the fact that I had submitted *photographs* of the interactions as evidence for the subtleties of their complex dynamics, rather than some abstractive analysis presented in tabular or graphical form.

Here we see what has become the hallmark of orthodox science: the obsessive blind faith in objectivity, and accompanying fear of subjectivity, so excommunicated from reality that it actually regards the *pure* abstraction as *superior* to the undivided reality it came from. Correspondingly, *Pure* Science and *Pure* Mathematics, freed from Earthly context, have always been the provinces of the elite in the Vampiric Halls and Ivory Towers of Academia. I could almost feel the editor of that journal putting his hands over his eyes to protect himself from the intrusion of the picture I presented, with the invitation to him and his readers to see and appreciate for themselves what lay in front of their noses.

For numbers, as we have come to understand and use them in orthodox mathematics, are arithmetic's equivalent abstractions to the points, lines, planes

and solids of Euclidean geometry. They excommunicate us from nature in the very process of attempting to represent nature in the form of discrete, identical and hence characterless entities - pure statistics. Most of us don't like the feeling of being regarded as pure statistics for this very reason. It removes our *feeling* and destroys our unique sense of *identity*, through which we can contribute to the well being of our communities through our differences that combine to make a difference. It renders us alike to those 'sticks in the ground' that I perceived the trees to be as I advanced upon them, chainsaw at the ready, to convert them into the stumps that were the object of my experimental investigation. When we treat ourselves as statistics, we become prone to treat ourselves in the same way that I treated those trees, as reproducible and expendable in the pursuit of our goals.

At the cold heart of the numbness of numbers, as we have come to use them conventionally, is the aloneness of the *singularity* that we call 'one'. 'One is one and all alone and ever more shall be so' - in the words of the traditional song, 'Green Grow the Rushes, O'. So, by what magic or sleight of hand, akin to that which transforms Euclidean points into lines and lines into planes and planes into solids, can two lonely ones ever make two?

'One' is *primarily* a number *dislocated* from its spatial relationship with other - its *neighbourhood* - and so 'isolated' as a fully discrete, independent unit or whole. This dislocation becomes apparent when we multiply it by itself and get the same as what we started with. No matter how many times we multiply it by itself all we get is a reproduction, a clone - more and more of the same. No other numbers behave in this way, even though we regard them as being composed entirely/purely of ones. Two, for example makes four when multiplied by itself, implying that it is in some way more than just two ones. This is known as an 'emergent property' of 'two', contrary to the linear 'law of superposition', which states that a function of  $a$  plus a function of  $b$  should equal the same function of  $a+b$ .

There is a profound inconsistency here. It is as though a one-way filter has been inserted between one and all the other numbers, as well as between progressively larger numbers, such as 2 and 3, 3 and 4 etc, when these too are treated as independent wholes in a Vampiric hierarchy. Through the imposed closure arising from the fallacy of the excluded middle, 'one' has been deprived of its common space or neighbourhood in which it relates with others. 'One', in other words, has been de-contextualized. A world consisting entirely of independent 'ones' can therefore only be utterly incoherent or random. This is the nightmare anarchic world of independent objects envisaged through impositional logic, which can only be held together by force.

In this estranged, de-contextualized world of abstract singularities, only content counts. Conventional numbers, then, are a representation of pure content, strung out along a linear scale from the very small to the very large and both positive and negative on either side of the 'absence of presence' known as 'zero'. At the very small and very large ends of this scale are some very weird constructions known as infinitesimality and infinity, which make no sense at all in relation to the finite entities found elsewhere along the scale. Infinitesimality is the limit to which finite content can be subdivided, but is smaller than the smallest finite number that can be counted. Infinity is limitless content, larger than the largest finite number that can be counted. Both infinitesimality and infinity are, however, inventions made necessary to jump the gap of the exclusion zone constructed around 'one' and based on the illusion of solidity.

As I will explain in a later chapter, none of this weirdness, which many of us accept as perfectly rational in our hard-line definitions of the world about us, would be necessary if we had not uncoupled space from our consideration of numbers in the first place. Had we understood that space cannot be excluded from matter, and hence that numbers, as representatives of natural features necessarily have inner and outer spatial aspects, mediated through their dynamic interfaces, no number would have stood alone. Instead, every number, one

included, would have been understood as a qua-ternary dynamic flow-form couple of inner, outer and intermediary. Infinity and infinitesimality would have been understood as representing the never-ending *possibilities* of spatial context rather than pure content, all alone.

### ***Globalization - The Spread of Anti-Culture***

At first sight, it's easy to dismiss the adverse influence that impositional logic has had on our understanding of nature and human nature. Surely something so abstract couldn't have made *that* big a difference? Surely we can accept that the product of impositional logic is a close approximation to reality, if not the real thing, and as such is still useful and can't do too much harm?

To my mind, however, impositional logic has had an enormous adverse influence, not least in removing, and threatening to remove, so many of the differences that make human culture and the natural world so richly varied. Like it or not, impositional logic, like cancer, constitutes an attack on diversity with a potential to overwhelm the 'all kinds it takes to make a world'. It imposes grey conformity on the colourful spirit of the carnival.

If you think I'm exaggerating the extent and influence of impositional logic, here are twenty examples of its modern usage.

1. All mathematical treatments of 'numbers' as discrete, independent 'units' or simple assemblies of such units.
2. All mathematical treatments of boundaries as space-excluding limits - Euclidean lines or surfaces lacking width or depth.
3. All units of measurement of space, time, matter and energy as absolute quantities.
4. All notions of absolute freedom, randomness, completeness and closure.

5. All axioms, falsifiable hypotheses, fixed reference frames and given sets of 'initial conditions'.
6. All definitions and definitive use of language.
7. All efforts, practical and theoretical, to exclude the influence of the observer from the observed, the external from the internal and *vice versa*.
8. All predictions of dynamic system behaviour based on regarding such efforts as entirely successful.
9. All claims of 'objectivity'.
10. All 'constants'.
11. All assumptions of 'homogeneity/uniformity'.
12. All impositions of a primarily linear order on natural organization, and corresponding treatment of 'non-linearity' as 'secondarily emergent'.
13. All treatments of particulate entities as primary 'building blocks' or 'ingredients' rather than 'products' of nature.
14. All renderings of 'uncertainty' or 'unpredictability' as being due to fully accountable 'error' or 'deviation'.
15. All simple attributions of 'cause' and 'effect', and corresponding 'blame' and 'responsibility'.
16. All notions of 'self' as an independent entity.
17. All corresponding notions of 'selfishness' and 'altruism'.
18. All treatments of 'choice' as the result of 'selection' by a purely external agency.
19. All treatments of 'the environment' as 'surroundings'
20. All notions of 'adaptation' to purely external constraints.

Such widespread adoption of impositional logic has impacted on human lives everywhere, through the spread of a culture of adversarial opposition (one against other) or 'Anti-culture' into almost every nook and cranny of the world. There are many symptoms of the dis-ease that has accompanied this spread.

Here, as an expansion of some of the themes I have already touched upon, are some of them.

***Externalization of Authority.*** To remove space outside of content, and so, effectively, outside of ourselves, is tantamount to removing our inner focus of motivation, and believing in a primarily static existence that can only be moved by external force. Independence from space comes at the expense of transferring influence from inside to outside and so becoming dependent on external authority to govern all motion. In other words, our belief in free will and internal purpose paradoxically implies the absolute loss of free will: the abandonment of self to the deterministic control of closed space or random capriciousness of open space. We leave our fate in the hands of God, Law, Natural Selection or Outrageous Fortune, all acting from outside, beyond our own influence.

***Adversarial Governance.*** Having effectively disempowered our inner selves by regarding ourselves as independent entities at the mercy of external forces, it is only natural to feel lost. But there is one way to regain the illusion of influence and coherence in our lives – that is, to wield external authority ourselves, or to be bound by that authority to obey whatever rules it happens to lay down. We therefore generate Vampiric hierarchical power structures with those nearest the top, closest to the ‘almighty’ in one way or another, laying down the ‘Law’ to increasing numbers of ‘lesser’ beings below.

Such hierarchical power structures continue to dominate all kinds of human communities as the self-perpetuating ‘ordering’ mechanism of Anti-culture. Even in the most benevolent and well-intentioned, hands, they impose the most extraordinary abuse on their subjects. This is because power administered from outside or on high or some remote centre is inevitably dislocated from feeling the effects of its own influence – what it’s actually like to be one of its subjects. Such

power is equally unable, for the same reason, to respond to real creativity at the dynamic boundaries of the community it assumes governance over.

Hierarchical power structures implicitly presuppose that in the absence of their influence over independent subjects, all would inevitably break down into an utterly incoherent anarchy. To prevent this seeming disaster they are therefore obliged to find and impose suitable rules of conduct and administrative policies. However, in the assumed absence of any kind of natural order to derive these rules and policies from, much may depend on the personal positions and intentions of those in, or seeking power. It then becomes necessary to find ways of choosing which rules and policies to impose and follow.

Political choice-making in an hierarchical power structure is one of the mostly deeply divisive afflictions of Anti-cultural modern human societies. Even where the choice is offered democratically to all the people, the outcome most emphatically *never* serves all the people and so becomes a focus for feelings of disempowerment and resentment. This is because although the electoral process might be democratic, the result of the election is not democratic governance, seeking to represent all viewpoints in a balanced way, but majority rule. Majority rule, seen from the minority viewpoint, is nothing less than bullying, a requirement to live under the rule of others' opinions, which have no monopoly on truth.

The resulting tensions are exacerbated not only by the simplistic 'either/or' assumptions underlying the notion of 'choice' itself, but by the way an electorate must reduce a complex multiplicity of choices down to a simplistic choice between one political party or another. Instead of a bringing together of diverse perspectives to discover what common view can emerge amongst them, there is continual adversarial debate and entrenchment of disagreement. Such is the inertial state of adversarial governance throughout the world, in which there are currently no true democracies, only hegemonies.



**Noisy Transmission.** Any form of governance by authority necessitates a means by which that authority makes their intention known to recipients, along with the basis upon which this intention can be executed. In other words, the authority has to instruct recipients by providing and communicating 'information'.

This notion of information as something instructive that can be transmitted assertively from authoritative source to subjugated receiver pervades Anti-cultural scientific, managerial and educational theory and practice. It is at the heart of the information theories developed in the 1940s by Shannon and Wiener, from which modern information technologies developed. It also underpins the neo-Darwinian interpretation of genetic information as providing the blueprint instructions for assembling diverse life forms and subjecting them to natural selection.

For such transmission to work, the information needs to be reproduced exactly by the receiver. Any outside interference that could corrupt or contaminate it is therefore seen as undesirable 'noise', needing to be eliminated. The authoritarian transmitter of information therefore does everything to eliminate outside interference whilst noisily amplifying their own pre-determined message. In other words there is an amplification of 'self' accompanied by suppression of 'other', of the kind suggested by the notion of 'survival of the fittest'. (S)he who shouts loudest is most heard. Listeners are expected not to answer back or talk amongst themselves. Anti-culture becomes ingrained, entrained, incapable of evolving or creating, only capable of reproducing more of the same.

**Imposing and Assessing Standards.** Hegemonic governance seeks, by its very nature, to impose conformity on human societies as the one and only way of ensuring coherence. Although it may recognize that individuals play diverse roles in the smooth running of the system, like the components of a clock, it is important that these roles be directed towards a specific overall objective and

performed at a level matched to that objective. Moreover, there must be general agreement to work towards a common purpose, be this the prosperity of a nation, a political party or a commercial company. Idiosyncrasies of ideology, skill or modes of working must therefore be minimized. Individuality is suppressed. Errors are not tolerated.

This conformity of operation is imposed through intimidation – disciplined schooling or ‘training’, often inaptly described as ‘education’. A prescriptive curriculum is set, standards are imposed, and the ability of individuals to meet these standards rigorously tested. Those who don’t meet the standards are rejected as ‘failures’. Acceptance – what may appear superficially as ‘love’ – is ‘performance-related’, dependent on ‘success’.

Fear of failure, and being labelled as a failure, therefore greatly blight our chances of happiness in the Anti-culture. No success is everlasting. There is always another hurdle to jump and another pitfall to avoid. Fear of failure makes us fail to take on challenges, so that we miss out on living life to the full. We become protective of our seeming successes, warding off all possible sources of undermining and questioning of their reality. When, at last, we are obliged to admit defeat, we feel lost, humiliated, powerless and resentful, desperate and despairing. Not good enough.

***Crime and Punishment.*** Breaking the Rules laid down by external Authority is viewed in religious terms as ‘Sin’ and in secular terms as ‘Crime’. Both ‘Sin’ and ‘Crime’ are viewed as ‘Bad’, if not ‘Evil’, whereas abiding by the Rules is seen as ‘Good’. But where do the Rules come from, and how realistic are they? Who judges Judges? Laying down Law in ways that violate the reality of nature and human nature actually creates rather than prevents crime and the attendant need for punishment as a means of deterrence and retribution. If people cannot abide by Rules, then maybe it’s the Rules and their underlying cultural assumptions and conditions, rather than the people, who need to be put on trial and judged.

No human behaviour is context-free. The context of every behaviour is unique, and the long-term implications of every behaviour, whether for 'better' or for 'worse' are innately unpredictable. So to judge behaviour independently of context to suit the definitive requirements of universally applicable Laws of Right and Wrong is a violation both of reality and of those subjected to the Laws. So too is to create a context of disparity, deprivation, isolation and competition, perpetuating cycles of fear in which people feel obliged to struggle for their very existence in whatever way they can, honestly or dishonestly.

Rules that violate our human neighbourhood beg to be violated.

***False Economies.*** Perhaps the most powerfully self-perpetuating abstraction of Anti-culture, the one which keeps the whole demoralizing cycle of abuse going, is that extraordinarily corruptible and corrupting, imposed system of values and valuations – money!

There can be no denying that money has increasingly become the predominant driving influence on human behaviour. But what is money? Is money valuable? Have we become enslaved by our own artifice, subject to the vicissitudes of 'market forces'? Do we have to be? Can we break our addiction?

Money is not a natural product. It does not grow on trees, gambol in pastures or collect in rock formations. Rather it is an abstract symbol for how much we value these natural products and our own efforts to harvest and convert them to our own use. Moreover it is an 'added value' symbol, in that it takes for granted, and so is inclined to treat as 'nothing', all that is 'already given' by way of the world we live in and its diverse inhabitants, including ourselves. Only when our pursuit of this 'added value' begins to damage what has been taken for granted and our natural relationships, do we pause to reflect on how much, say, a mountain means to us. When we have 'paved Paradise to put up a parking lot'. By then, so

entrapped have we become, that we even think we have to ascribe some monetary value to the mountain!

Money is also a symbol of our impositional concept of 'ownership'. This comes with our severance of 'self' from 'other' and resultant mistrust of one another. How possessively we regard our time, space and energy, fearful of giving away, or having taken away, too much that is rightfully ours! So we crave the security of a token system of checks and balances to ensure that credit is given where its due and nobody gets short-changed, all wrapped up in legislative procedures to ensure crime prevention. But the intended fair trade is quickly and easily subverted into unfair practice, as money becomes a source of power more and more remote from real values and subject to fashion and the impact of technology.

***Costly Victories.*** Seeing 'other' as 'adversary' precipitates conflict and the desire to win competitions, debates, battles and wars. Victory is generally regarded as its own justification – one of those desirable ends that legitimates any means and makes the conflict worthwhile. Yet such a view of victory is, by its very nature, extraordinarily one-sided. It ignores the cost to the victor in using up resources and vanquishing a potential ally whose stored up sense of loss may rise up vengefully in the future. It ignores all manner of collateral damage to innocent bystanders and living space. And, of course it ignores the cost to the loser. History affirms that conflict perpetuates conflict and is never resolved for good by victory. But history, in an Anti-culture that ignores context, seems to teach us nothing.

***Environmental Disregard.*** To view 'the environment', as even Einstein did, as 'everything that isn't me' – an infinite 'external surrounding' – is a recipe for abuse. From such a view, this 'infinite outsider' is all too readily regarded as an inexhaustible source of resources, a dumping ground and theatre of war that can be exploited, polluted and blasted without repercussion. Although we are more

sensitive to it than we used to be, this abuse continues unabated to this day, and we continue to set the needs of the environment in opposition to human social and economic requirements, with the latter taking priority.

***Eliminative Medicine, Agriculture and Eugenics.*** Notwithstanding Louis Pasteur's deathbed acknowledgement that 'the microbe is nothing, the terrain is all', we continue rationalistically to regard illness and its 'causal agencies' as adversaries to be eradicated rather than as symptoms of an adverse context. We tend to focus on curing disease rather than promoting health. We wage war, developing surgical techniques and pharmaceutical weapons in the form of antibiotics and 'magic bullets' guided precisely to take out enemy agents and their sites of operation, but losing sight of the possibilities of collateral damage in the form of side effects. The need to secure financial advantage sustains this war, and inhibits the honest and open discussion required to understand its context.

The eliminative process we use to make ourselves better is taken to even greater extremes in the way we treat our cultivated plants and domestic animals. Ever on the lookout for ways to increase their productivity, we label anything that gets in the way as a pest, weed or pathogen, and set to work removing them with pesticides, herbicides, bactericides and fungicides. Failing or in addition to that, we use selective breeding to improve performance and disease resistance, and nowadays there is also great interest in the possibility of directly modifying the genetic content of plants and animals by transferring DNA between widely differing organisms.

All these methods have the effect of abstracting life forms from the context in which they have co-evolved, into a new and potentially highly unstable and unpredictable dynamic arena. Forms may be produced which are unattuned to natural conditions, and their mass production in monocultures reduces diversity and increases susceptibility to catastrophic losses. But once we have initiated

this kind of production, we become dependent on it and trapped in its powerful cycles. We become addicted.

We need also to be wary of applying the same kind of eliminative logic to the enhancement of human populations. Although history has made some of us quake at the very mention of the word, 'eugenic' practices are never far from the surface of human Anti-culture.

***Apathy and Employment at All Costs.*** Politicians often get very upset when no one 'bothers' to vote at an election. They are justifiably appalled when people seem to lose sight of their need and right to participate in and take responsibility for decisions that affect their lives. But in looking around for anyone and anything to blame for such 'apathy', they rarely examine the assumptions underlying their own political thinking and structures.

Anti-cultural political systems breed apathy because they remove responsibility and the ability to participate from all but the few selected to govern. These select few, like the Pope in his bath, are prone to look down on the unemployed. Obsessed, as they are in an Anti-culture, with economic performance, they find value only in what people do rather than in their relationships.

Unemployment is therefore equated with worthlessness and waste of 'human resources', a terrible drain on the system, a kind of social parasitism. With this political refrain ringing in their ears, not to mention the associated absence of monetary reward, people naturally come to fear unemployment like the plague. Employment is sought at any cost. The most iniquitous activities are justified because they provide employment. Relationships of all kinds are sacrificed to the needs of being demonstrably busy, and those who aren't busy lose all sense of self-esteem and involvement in the community.

And so, the relentless combined driving force and disempowerment of Anti-culture engenders a curious duality of busy employment and apathetic disengagement in which people have no time for one another or for the activities that bring true well being and creativity.

***Fearful Hatred.*** The communal fear inherent in Anti-culture, the sense that life is under continual threat from other life, can only bring hatred for that other life and a desire to eliminate it to make things better. The vicious cycle that leads to genocide, homicide, suicide, religious persecution, civil war, international war, arms races, terrorism, tyranny, dishonesty and betrayal self-perpetuates, at terrible cost. History teaches us nothing. We still ask, 'whose side are you on' and won't take 'neither' or 'both' for an answer.

### ***Can the Desert Bloom?***

So, the question is do we have to stay in this arid world of confrontation? That's the question I will be considering in the remainder of this book. I hope you may find some grounds for the growth of optimism, because the alternative's rather grim.

## **2. Welcome to the Common Space - Where *All* Really Is *Flow***



## ***The Emergence of 'Inclusionality' - The Inextricability of Space From Time, Energy and Matter***

***Approaching Crisis.*** One morning, a few years ago, I woke up from a startling, extraordinarily powerful dream, in which was preparing a demonstration class for *students* on the processes of *decomposition*. I gathered together a sample of *leaf-mould*, the combination of fallen leaves and fungal mycelium to form a mulch, taking very great care to *exclude* any kind of *wildlife* that might be *dangerous to the students*. I put this sample into a *transparent*, perspex box, so that it could be viewed readily from outside. To my horror, as I observed the contents of the box through the perspex, I saw a thin-bodied *green and yellow snake* emerging from the leaf-mould. I *couldn't tell* whether this was the *deadly venomous* South African '*boomslang*' or one of the several 'harmless' snakes that appear very similar. Then the snake found a *hole* in the side of the container and started to slither through. I realized that I now had *no alternative*. In the interests of the *safety of the students* I had to *handle* the snake, no matter how *uncertain* I might feel about its *venomous potential*. No sooner did this realization come upon me, than the snake coiled up into a tight *spiral*, like a millipede, and spun *gyroscopically*.

The rich *symbolism* and *prescience* of dreams never ceases to amaze me, and of course there are many stories of the role dreams play in major breakthroughs for humanity. How can it be, that in this 'unconscious' realm we gain access to so much that relates so deeply to the concerns affecting us and our relationships with others? I have *italicized* some of the symbols in the above dream that seem important to me, but before I offer some of my own interpretations of these symbols, I want to outline some of the relevant experiences that led up to it.

From around the mid-1990s, I began to experience an intensification of symptoms others dismissed as mid-life crisis. Actually, I was feeling an intensification of the incongruity between my life experience and values and

those of the academic system I was trying to participate in as a Biology teacher and researcher. Not only did I suffer the agonizing doubts about the validity and worth of my scientific efforts, but I also felt an increasing sense of fraudulence - that I had assumed a mantle that simply did not suit who I am. In short, I felt like one of those dark, Vampiric figures of the Wasteland depicted in my painting, 'Arid Confrontation' (Figure 1). Apart from a few minor rebellions where I couldn't help but put a spanner in the works of some scientific bandwagons, I had allowed myself to be defined and subsumed by others' expectations. But I couldn't live either up or down to these expectations. Symptomatic of my desolation was the fact that in a period of over twenty years I had painted only four pictures - two for each of my two daughters.

These feelings grew as, like many University scientists, I struggled to keep my research activities alive and support my students and colleagues in an increasingly competitive, egotistic and mechanistically and commercially oriented culture. I had experienced an interlude, from 1987-1991, when I was supported by an unusual organization, 'BP Venture Research Unit', which actually recognized and valued research aimed at enhancing understanding rather than achieving predefined targets. But otherwise, I found that the attitude of most funding agencies towards scientific creativity was akin to millstone grit. It has got even worse following the advent of the 'Research Assessment Exercise', which uses the most grossly unscientific and prejudicial techniques to rank UK University Research in alignment with Governmental demands for competitiveness. I was required to know in advance what the findings of my research would be, to show how these fitted with the predetermined goals of the funding agency, and to describe how these findings would be delivered within a prescriptive time schedule. Scientific research was regarded not as an uncertain exploration into the realms of the beautiful mysterious valley of serendipitous discovery, but as a production line. Many of my colleagues feigned compliancy with this idiocy by applying to do research that they had already done, playing political games,

forming crony groups and inventing esoteric 'buzzwords' that would get the nod from their peers.

Whilst I found all this extremely distasteful I still attempted to offer what was asked, as far as my values and abilities would allow. For a while, I just about managed to keep afloat. Our research group even got as far as developing a novel explanation for the chemical ecology of fungi, working with a Pharmaceuticals discovery company. But the funding agency wasn't pleased. It wanted specific ready-made products with names and structures attached, not a general understanding of when, where and why these products were formed. Above all, it did not want to know about the fundamental nature of fungi as complex dynamic systems whose full biochemical repertoire couldn't be expected to be reliably controlled within the restrictive conditions of existing industrial production plant.

As the inevitable 'crunch' approached, the rebellions of my soul grew ever more rampant. I resumed painting in earnest in 1997, and helped to form a local group called Bath Bio\*Art, whose aim was to link biological science to an artistic perspective of life. I hoped that this perspective might alleviate the cancerous malaise creeping through the scientific community and enable a more creative, contextually sensitive way of working. In the same year, my book, 'Degrees of Freedom - Living in Dynamic Boundaries', was published, in which I began to question the underpinnings of conventional natural selection theory.

The following year, 1998, I became President of the British Mycological Society. I regarded this position as an immense privilege, but it exposed me more than ever to my own doubts and sense of others' expectations. It took an enormous effort to keep going through this year, which culminated in a 'President's Address'. This took place in the Lecture Room of the Linnaean Society in London where Charles Darwin had presented his famous paper with Alfred Wallace in 1858 concerning 'The Origin of Species'. So here was I, a heretic in the making,

presenting my address in the same place and under the gaze of a huge oil painting of the Great Man Himself!

I knew in my heart of hearts that this President's Address would be my mycological swansong, so I wanted to present something special. I was well past being able to deliver a paper full of technical data and scholarly references, so I decided instead to present a celebration of the inspirations I had felt over the years as I searched for clues to the mysterious relationship between fungi and trees. This relationship had first entranced me as a boy on forays with my father. I called my address 'Fountains of the Forest', and based it around the painting shown in Figure 3, which I made a gift to the Society.



**Figure 3. 'Fountains of the Forest'** (By Alan Rayner, Oil on Board, 1998).

*Within and upon the branching, enfolding, water-containing surfaces of forest trees—and reaching out from there into air and soil—are branching, enfolding, water-containing surfaces of finer scale, the mycelial networks of fungi. These networks provide a communications interface for energy transfer from neighbour to neighbour, from living to dead and from dead to living. They maintain the forest in a state of flux as they gather, conserve, explore for and recycle supplies of chemical fuel originating from photosynthesis. So, the fountains of the forest trees are connected and tapped into by the fountains of fungal networks in a moving circulation: an evolutionary spiral of differentiation and integration from past through to unpredictable future; a water delivery from the fire of the sun, through the fire of respiration, and back again to sky. (From Mycological Research 102, 1441-1449, 1998).*

**Breakdown and Breakthrough?** Three months later, my wave finally broke and I began the process of reclamation that continues to this day. I found myself working across disciplines and with all kinds of people who I would have been most unlikely to encounter in my former guise, whilst still somehow employed by the University of Bath in the Department of Biology and Biochemistry.

Then, in Spring 2000, I received 'out of the blue', an e mail message from Doug Caldwell, a Canadian microbiologist who had developed a 'non-Darwinian' view of evolution based on his work with 'continuous culture systems'. He had published his ideas in an article in *Advances in Microbial Ecology*, to the chagrin of many of his colleagues. He told me he had heard that I had expressed somewhat similar ideas, and would like to discuss whatever commonalities and differences we might have with one another.

I was delighted by Doug's message. For me at least, such expression of interest in one's work by another scientist from a different specialism accompanied by an

invitation into discussion, was all too rare. Doug's message contained a hint of something I had longed to hear – a 'honk' of encouragement. Maybe I wasn't quite as scientifically alone as I felt.

Our conversation dived straight in at the deep end, assuming Universal proportions before I knew what had hit me. 'Do you think that life is an infection of a dead Universe?' Doug demanded. 'Er...pass'. But, despite my hesitance to entertain such questions, I was tickled to find another who reflected my own feeling that it wasn't possible to understand the local details of biological diversity without addressing much larger issues. Doug also expressed ideas he called 'Universal Information Theory' and 'Nested Proliferation Theory', which indeed seemed to correspond in many ways with the co-evolutionary thinking that I had begun to express in 'Degrees of Freedom'. Moreover, Doug questioned the notion of 'natural selection', describing it as a 'superstition' rather than a 'mechanism', because it invoked a mythical, purely external agency making judgemental decisions about what was or wasn't good enough. On this, I agreed with Doug, even though at that stage I had not got as far as I have now in resisting the notion altogether.

Not long after our conversation began, Doug introduced me to two more correspondents, Dirk Schmid, a former research associate of his, and someone he described as 'a very interesting person', called Ted Lumley. Ted was a geophysicist and disenchanted former oil company executive, interested in the way 'exceptional teams' work. He had become very concerned about the social and psychological damage induced by rationalistic thinking and proved an extraordinarily prolific correspondent. In 'no time' (for absolute time, split apart from space, found no place in Ted's relativity-oriented thinking), our in-boxes started to groan under the load of accumulated messages. Prompted by Dirk, we began to think about how we might best organize and disseminate our missives as a discussion group, and hence how to label our theme for ease of reference. Another deluge of correspondence followed as we each suggested candidates

and got worried about having cramping our own style by imposing inflexible, over-technical or inappropriate definitions. Eventually, Ted picked out 'inclusionality' from one of my lists of candidates as having the right 'flavour', and we settled on that.

***The Meaning of Inclusionality.*** 'Inclusionality' therefore arose simply as a convenient label. It expresses the idea that developed as our conversations unfolded and came to encompass others, namely that *space, far from passively surrounding and isolating discrete massy objects, is a vital, dynamic inclusion within, around and permeating natural form across all scales of organization, allowing diverse possibilities for movement and communication.* Correspondingly, boundaries that are regarded as discrete, fixed limits of isolated objects or systems from an orthodox perspective are seen inclusionally as pivotal, relational places. Here, complex, dynamic arrays of voids and relief both emerge from and influence the co-creative togetherness of inner and outer domains, just as the banks of a river simultaneously express and mould both flowing stream and receptive landscape.

At the heart of inclusionality, then, is a simple but radical shift in the way we frame reality, from absolutely fixed to relationally dynamic. This shift arises from perceiving space and boundaries respectively as continuous and connective, receptive and responsive – and hence co-creative, rather than severing, in their vital role of producing heterogeneous form and local identity within a featured rather than featureless, dynamic rather than static, Universe.

In this way we move from perceiving space as an absolute 'absence of presence' – an emptiness that we exclude from our focus on material things – to appreciating space as a relative 'presence of absence'. In other words, space is an inductive 'attractor' whose ever-transforming shape provides the coherence and creative potential for all kinds of evolutionary processes to occur.

Correspondingly, we can transform the orthodox *impositional logic* of discrete, complete 'objects' into the heterodox *inclusional logic* of distinct, relationally dynamic 'places' or 'neighbourhoods'. These places have reciprocally coupled inner and outer relational domains that are both distinguished by and communicate through space-including, and hence permeable or holey, intermediary domains. In other words, we move from the one- (unitary) or two- (binary/dual) aspect fixed 'logic of the excluded middle' to the three-in-one (quaternary) relationally dynamic 'logic of the included middle'.

Note that this inclusional logic is therefore neither entirely reductionistic (assuming many wholes, interacting linearly as parts of larger wholes) nor entirely holistic (assuming one whole or unity). Rather it is a dynamic coupling of one together with the other over all spatial scales. Correspondingly, the idea of *neighbourhood* is neither *entirely* 'the space around a discrete entity' nor *entirely* 'all the entities within a discrete space', but rather a *nesting togetherness* of local (inner) included within non-local (everywhere) through dynamic intermediary (bodily) realms.

When space is thus included in our dynamic accounting for nature, it becomes inseparable from the energy that makes us alive. Light is an inclusion of darkness, electromagnetism an inclusion of gravity, and neither time nor matter can exist as separable, absolute quantities in their own right. We neither see the world and universe about us as an incoherent assemblage of independent objects/closed systems surrounded by emptiness, nor do we lose ourselves in a featureless oceanic infinitude.

So, the new logical premise of 'inclusionality' is of the *dynamic incompleteness* (holeyness) and *interdependence* of distinct places (neighbourhood) rather than the completeness and independence of discrete objects. Could this new premise help to irrigate the landscape deserted by human Anti-culture, and allow the world of *flowers* to bloom once more?



***Beyond My Ken.*** Now, I want to revisit the dream I described at the outset of this chapter and ask how it might relate to the emergence of inclusionality. To begin with, the dream seems to be depicting something about the nature of the very particular scientific method of enquiry that arises through adherence to the law of the excluded middle. The enquiry begins with the selection and abstraction of a sample. This is placed within some actual or theoretical limiting boundary or reference frame and then studied in isolation from its natural context (neighbourhood). A part of nature is excised and brought under scrutiny within the imposed framework of the sampling grid, laboratory, containing vessel, experimental apparatus or mathematical construct. Its properties and behaviour are thence defined and predicted in terms of rules, laws and principles that are discovered to apply within this framework through the proposition and testing of hypotheses. From this small picture contained within the part, it is expected or hoped that an understanding can be obtained of the big picture of the whole from which the part was derived.

The exclusion of the undesirable sources of uncertainty is very obvious in my attempt to keep out anything wild and potentially dangerous to the students. This attempt is well intentioned, but also has the potential to prevent the students from apprehending reality, hence making them accept an abstract view. The insertion of an invisible barrier reinforces this abstraction, so that the contents of the box can only be seen and not felt. These contents, meanwhile, consist of apparently particulate 'units' (leaves), which, in reality are collectively bound together through the tubular network and labyrinthine inner spaces of fungal hyphae. And, from the midst of these contents emerges the very aspect of nature that I had tried to exclude, in the other worldly, unpredictable, potentially deadly form of the snake with the profoundly resonant name. Like it or not, this form is inextricable from and vital to the dynamic reality of life, and worms its way out through a hole in the otherwise closed, rigid boundary of the box. But, like it or not, the moment I realize that I am going to have to handle this form, and hence establish a feeling

relationship with it, it transforms from linear and dangerous into a benign spinning spiral. It gyroscopically balances reciprocal curved space potentials, like a rolling coin.

The dream therefore seems to express what I, alongside others involved in the inclusional conversations, have come to view as the inextricability of space from energy, matter and time. Like it or not space and the uncertainty it implies is both intrinsic and extrinsic and intrudes and extrudes everywhere through whatever kind of barriers we may try to put in its way. But if we are prepared to include it in our consideration, it can transform our comprehension of the living world about us.

In my own efforts, both conscious and unconscious, to include space in my considerations of personal and scientific uncertainty, I have found myself getting into ever deeper, ever hotter water! I have found it necessary to venture into the realms of ideas and disciplines far beyond what my peers or I might initially have perceived as my ken. But, like them or not, I felt these realms were simply too important to ignore or hide away from if I was to follow through the implications of my thoughts and experiences. I simply had to try to make my own kind of sense of them, in language that I at least could follow. In doing so, I have found my understanding of the world about me transforming in ways that have come as an enormous surprise.

In the following sections I will try to relate something of my surprising interdisciplinary navigation through the deep, hot watery realms of uncertainty. Doubtless I have followed in the wake of others whose findings and experiences might have helped if only I could have known them better. But at least I know that this is my uniquely situated and recreated story, the product of what my friend Jack Whitehead would call my 'living theory action research', which I now wish to share.

## ***Dynamic Boundaries***

Before our inclusional discussions, I had never focused directly on space as such and its importance in understanding dynamic processes. Indeed, to focus on space would have seemed like a bit of a contradiction in terms – how can you focus on what appears to be nothing – an absence of presence? So, as with many other people, space was a purely implicit background to my thinking, which I took for granted and didn't attract my immediate attention. What I had focused on, however, as the result of my biological and especially my fungal studies, was the dynamic nature of living system boundaries. I had concluded that to regard these boundaries as places of severance that isolated life forms at any scale of organization into discrete individual entities or 'units' was unrealistic. It fails to recognize where and how the wonderful variety of life patterns emerge, which I linked to ideas emerging in the fields of chaos and complexity theory.

By focusing on boundaries as places of dynamic, co-creative relationship, I found what felt to me like a much more satisfying way of understanding the evolution, interactions and development of life forms than the 'survival of the fittest'. The pressure cooker world, in which the growth of populations of independent individuals with selfish genes comes up against discrete limits imposed from outside, leading to the *elimination* of less 'fit' or 'adapted' performers, had never made much sense to me. It was just too full of contradictions and internal inconsistencies, arising ultimately from the fallacy of the excluded middle. Discrete limits between insides and outsides do not and cannot exist in the reality of a dynamic biosphere on a dynamic earth in a dynamic Universe. How, in this pressure cooker world, could a process of *elimination*, which leads inexorably to *monoculture*, also give rise to diversity? If you try to explain this by saying that there is a diversity of pressure cookers (known technically as 'niches'), then where do these different pressure cookers come from? How can you explain the occurrence of sex in a world in which more of the same is allegedly better? Why

are there so many examples of distinctive life forms living in intimate association with one another in so-called 'symbioses'? How come natural communities of organisms are so elaborately and coherently structured?

Accepting that boundaries were sites of dynamic, co-creative relationship rather than abrupt severance allowed a much more fluid perception of living patterns to emerge in my mind. This corresponded with my actual experience of Nature and the unconscious aesthetic awareness of my artwork. I found something joyous and inspirational in this perception, with its sense that life *eases* rather than *bullies* its way, by both creating and following paths of least resistance. I envisaged organic life, as we know it on Earth, as an embodied water flow forming droplets, pools, rivers and eddies everywhere, both deep and shallow, in the process of emerging locally in the flow-forms we call organisms, populations and communities. I saw evolution as a process of continual contextual transformation, a necessary co-evolution of larger context with its locally expressed content, with each shaping and being shaped by the other. I saw genetic 'nature' and environmental 'nurture' as inextricably intertwined, with each other's influence coinciding in the dynamic boundaries of living systems. I saw 'niches' not as closed down pressure cookers imposing do-or-die constraints, but rather as co-created, co-creative, catalytic vacuums, forever opening up new creative possibilities.

So, what makes boundaries dynamic and how does this influence the patterns produced by the flow-forms of life? My first approach to answering this question was based on my observations of the riverine growth forms of fungal mycelia. I recognized three basic relative properties of boundaries, which influence the patterns produced by flow-forms by varying their resistance to the transfer and distribution of energy sources. The *deformability* of boundaries is reciprocally related to their rigidity, which resists expansion and contraction due to assimilation and release of energy sources between insides and outsides. The *permeability* of boundaries affects their resistance to passage of energy sources

between insides and outsides. The *contiguity* of boundaries affects the internal channelling of energy sources, the resistance to which is increased by various kinds of interruption and decreased by enhanced connectivity.

My idea was that by varying the deformability, permeability and contiguity of their boundaries, living systems can gather, conserve, explore for and redistribute energy sources in close and highly efficient correspondence with their local contextual circumstances. I felt that there could be much for human societies to learn from understanding the importance of all of these processes, if we are ever to dwell in truly sustainable relationship with our living space.

Only under circumstances of external plenty is it appropriate for boundaries to be both relatively permeable, allowing uptake of energy sources, and deformable allowing expansive growth and the consequent differentiation/ proliferation of boundary surface. These circumstances are generally assumed to apply indefinitely by capitalist economic theory and neo-Darwinian models of evolutionary fitness (notwithstanding the paradoxical assumption that competition becomes most intense as resource 'limits to growth' are approached).

There are, however, many circumstances when the supply of external resources runs short, including when there has been earlier uptake into the system. Under these circumstances, the increase of permeable surface would promote net loss of energy sources due to leakage, and so processes that limit or redirect growth become necessary. These processes minimize surface exposure by sealing, fusing and redistributing boundaries to serve distinctive life functions.

Correspondingly, by rigidifying, fusing and sealing boundaries, living systems can conserve energy sources in resilient, dormant structures that survive adverse conditions, as with plant seeds, bulbs, corms and tubers. Alternatively, by sealing deformable boundaries it is possible to explore adverse terrain from a local haven, as in plant runners. By partitioning off redundant parts, the energy

sources they contain can be redistributed to other parts of the system, as with the ageing and fall of plant leaves.

Through focusing on these boundary properties, and the way they can vary according to circumstances, a pleasing picture emerged for me of how I could account both for the different patterns observed at distinctive stages of an organism's life history and for the distinctive life histories of diverse organisms. But there was also another, wider and deeper answer to the question of what makes boundaries dynamic, which is implicit in their relative deformability, permeability and continuity. This answer became *surprisingly* obvious as my discussions with Ted Lumley got underway. It also connected with conversations I had been having with my Nigerian friend, Lere Shakunle, who had recognised a problem deep in the foundations of orthodox mathematics. This answer appealed greatly to my own artistic sensitivities. The answer is none other than the vital presence of absence we call space.

### ***Eureka! Space - The Ultimate Fluid and Source of All Fluidity!***

So, what is space, really? Here are some of the kinds of questions I have asked myself in order to try to gain a deeper understanding of the vital role of space in evolutionary creativity.

Try to imagine a world or Universe without space: would there be any *room* to move? Now try to imagine a world or Universe of *pure* space: is there anyone there? Take a look at the sentences I have just written, or the one I am writing presently: what do you perceive? What do the sentences have in common? What makes them different? Perhaps you might consider that space is 'distance' - that it is what comes between 'things'. Perhaps you might consider that space is nothing, as it has no substance to it. In which case, nothing comes between things - what, then, is keeping these things apart? Can the letters in this

sentence have any meaning - make any difference - without space? Can the spaces have any meaning without the letters? What are the letters made of that makes them visible? Would they be visible if they were pure matter containing no space?

Through asking these kinds of questions, along with my conversations with others, I became increasingly aware of two distinctive aspects of physical 'presence', one explicit and tangible, the other implicit and intangible, which together produce meaning. One of these aspects informatively lines, (i.e. stiffens or surfaces) the other, which nests within, through and around it to give rise to the expression of the distinguishable, heterogeneous natural form(s) of the Universe in all its rich diversity and over all scales.

In art, these two aspects of presence are distinguished in terms of 'figure' and 'ground'. All works of art can be thought of as configurations of information, contained in the working materials that the artist intentionally or assertively brings into dynamic relation with receptive space. For example, the blank canvas invites the application of paint into an infinite variety of possibilities that the artist gives expression to. Meanwhile, the painter cannot help but be included in the emergence of the full complexity of the picture as the conveyor of paint inspired by the presence of the receptive space. The real artist ('virtual artists' may be another matter!) cannot sit, uninvolved like some distant voyeur regarding affairs through some transparent partition. A feeling relationship has to be established between the paint and the receptive space, through the dynamic embodiment of the artist who combines the two. It is this sense of engagement, as the dynamic intermediary connecting one with the other that delights the artist.

In this deep sense, Nature appears to me as a Work of Art, brought into complex expression through the combining of informational content with spatial possibility - stiffening with yielding - across all scales. The human artist is aping a creative presence that is not some eminent outsider, but the immanent source of varying

degrees of fluidity everywhere. Hence Nature corresponds with what many may refer to as 'God'. To fall out with Nature is therefore to fall out with God. Likewise, to fall out amongst ourselves, to be alienated and feel guilt and shame in our differences as unique expressions of Nature is to fall out with God. Such has been the fate of all kinds of orthodox and fundamentalist religions, as is implicit within their Genesis stories. The fallout from a nuclear explosion is perhaps the most dramatic expression of the implications of the ultimate excommunication of humanity from Nature, through our attempts to control it.

With these ideas in mind, my research companion, Songling Lin, worked out a relationship between 'complexity', 'information' and 'uncertainty', which he expressed as the following equation:

$$\textit{Complexity} = \textit{Information} + \textit{Uncertainty}$$

It's important to understand that this outwardly simple equation is not a conventional mathematical formulation, based on the self-contained, 'fixed' or 'closed' linear relationship of three independent, finite terms. Rather, by inclusively incorporating 'uncertainty' as non-finite 'spatial possibility', it establishes a three-way, interdependent, open and hence evolutionary relationship, which could perhaps better be expressed in the following forms:

$$\begin{array}{ccc} & \textit{Complexity} & \\ & / \qquad \backslash & \\ \textit{Information} & + & \textit{Uncertainty} \end{array}$$

Or



## *Information + Uncertainty → Complexity*

To my mind, this formulation overcomes the contradiction between thermodynamic and biological/computational views of evolutionary processes I will describe later. Because they focus purely on figure, to the exclusion of 'ground', the latter views respectively regard information either as pure negative 'entropy' ('uncertainty'/'disorder'/'randomness') or as pure complexity/diversity. Songling's formulation regards complexity as including both 'negative' (inductive) spatial possibility and 'positive' (assertive) information. It also relates to the notion of a 'complex informational signal' as having both an explicit or 'real' component and an 'imaginary' component, in the manner of a 'complex number' (which I will also be discussing later). This notion was the basis for Dennis Gabor's Nobel Prize-winning invention of holography.

Here, uncertainty in the guise of spatial possibility is a vital and inextricable inclusion in the complex, dynamic heterogeneity of the Universe, expressed over all scales. We begin to appreciate that space not only provides the common ground for the figurative expression of information, but also the *fluidity* that mobilizes this expression into dynamic features. The greater the incorporation of space, the less solid these features become. Correspondingly, the artist, through the incorporation of 'solvent' or 'medium', makes paint pigment more fluid. Just as a river eases its way through a landscape by conveying space into its own dynamic channels. In other words, the incorporation of space *frees up* creative possibility, whereas the removal or stiffening of space *closes down* possibility.

Space then, is present as the zero-viscosity source of fluidity that gravitationally pools the swirling contents of the universe together, like the solvent in a solution of solutes. Yet in our quest for concrete certainty we continually try to close it in or close it out. When we try to understand nature purely in explicit terms, it is like trying to explain the properties of a solution purely in terms of the solutes, whilst

ignoring the solvent. The potentially abusive implications of this one-sided neglect of 'solvent space' run deep for the way we relate to one another and our surroundings, as I acknowledge in the following lyric, which I wrote on the 60<sup>th</sup> anniversary of the liberation of Auschwitz:

### **Space - Your Final Dissolution**

I am your final dissolution  
The nurturer of your nature  
That soothes and softens  
As we live and breathe together

No gas-tight chamber doors  
Designed to wall in  
Or wall out your fears of devastation  
Can exterminate me

You cannot live without me  
You cannot die without me  
I cannot find expression without you  
You live in the breath of my inspiration  
You die in the breath of my expiration  
You die as you live  
You live as you die  
With me  
Within and without

So, if you try to close me in  
Or close me out  
In your Manly human quest for Godly immortality

I cannot love you as you stir within my womb

I cannot assist you  
I can only watch, impassively by  
As you use me to destroy  
Yourself  
Or suffocate in the stasis  
Of a never-ending, never-opening  
Paralysis  
That's no life for any one of us  
Alone

So, please, bear with me  
As I am alongside and within you  
Take me in as I take you out  
Certain only of the uncertainty  
That recreates a rich and vibrant world  
I am what life *and* death is all about

Rising and subsiding  
In ever-flowing form  
Living Light and Loving Darkness  
Together

All this raises the question of the relation of space to the elusive 'Ether' (or 'aether'), which philosophers and scientists have long pondered upon. Coincidentally, 'ether' is also the name given to a rather explosive chemical compound, which has been used both as an anaesthetic and an organic solvent.

The notion of the 'Ether' as some tangible aspect of space arose from observations of the wave-like properties of light. Since the detached view of waves, such as those in the sea, implied 'waves in something', i.e. in a medium, it was natural to suppose that 'light travelling through space', as to the Earth from the sun, was doing so in or upon this medium, the 'Ether'. Eventually, however, the existence of the 'Ether', was disputed because the necessary resistance or frictional influence of this medium on the velocity of light could not be demonstrated. Indeed, it was widely considered disproved by the famous Michelson-Morley experiment, from which Einstein deduced his special Theory of Relativity. The latter was based on regarding the speed of light as the only invariable (i.e. absolute) quantity in the Universe.

From an inclusional perspective, however, waves can be understood to emerge from the dynamic convex and concave interfacing of relatively more viscous (resistive/stiff) with less viscous (accommodative/yielding) phases. For example, waves in the sea arise from a reciprocal coupling of more viscous seawater with less viscous air.

The notion of light travelling as an *entirety*, dislocated from its spatial neighbourhood does not, therefore, make inclusional sense. On the other hand, the idea of light as a dynamic inclusion of space does make sense as a coupling of stiffening electromagnetic information with a yielding, zero viscosity, medium. Hence *light waves are simultaneously and reciprocally gravity waves* - not 'pure light' but 'dark-light', the most insubstantial (immaterial) dynamic form possible. All other dynamic forms are more substantial as they contain more matter, matter being a condensed form of space-including electromagnetic information. But all such forms require the inclusion of space to provide the necessary fluidity: there can be no such entity as 'a wave' or indeed 'a particle' absolutely dislocated from its neighbourhood.

Correspondingly, the notion of the *velocity* of any waveform travelling independently *through* space is an illusion created by a detached perspective and the abstraction of 'time'. The inclusional view reveals that the apparent lateral movement of 'a wave' is in fact the product of reciprocal dynamic coupling of convex and concave phases. Similarly, the notion of 'discrete particles' uncoupled from the space through which they are reciprocally moving and from which they draw energy, is an artefact of detachment. All journeys of inner content in one apparent direction are reciprocally coupled with an outer contextual transformation in the opposite direction. All distinct forms of moveable content, even those we are prone to define as 'waves' or 'particles' are therefore flow-forms, dynamic inclusions of electromagnetic field within spatial field. They have both wave-like (connectedness) and particle-like (distinctness) characteristics, whether in 'open interface' (as in sea 'waves') or 'encapsulating interface' (as in a tennis ball) configurations.

You may find, as I do, that the following exercise helps you visualize what is going on here. Find or purchase a toy 'windmill' of the kind children (and some adults who have retained their playful spirit) like to stick into sandcastles. Lay it to one side. Now, walk across a room. Ask yourself and any friends who might be watching you 'what has just happened?' Note your answers. Now ask, 'what else has happened?' Then walk across the room again, holding the windmill out in front of you.

This exercise reveals just how prone we are to focus on the apparent independent action of the explicit/manifest 'content' and lose sight of the yielding of the implicit/invisible spatial context upon which the action depends. The usual response to the question 'what has just happened?' is to say 'I/you have just walked across the room'. The usual response to the follow-up question 'what else has just happened' is mystified silence and/or expressions of puzzlement.

It begins to become clear that there is more going on than just a visible local object walking across the room, through the spinning of the windmill when we hold it in front of us as we walk. So far, so good, but even then we are prone to stop short of more comprehensive understanding. We do this by imposing an invisible fixed reference frame or 'snapshot in time' around the 'action and reaction' of given objects whose dynamic origins we don't consider. We then 'explain' the spinning windmill in terms of displacement by/of resistive/assertive 'air molecules'. We overlook the reciprocal transformation of the less viscous air-space that is invisibly coupled with the flow of our more viscous bodies in the continuing now of our dynamic relational experience, which can never be fixed.

To understand this it is necessary to appreciate that the spinning of the visible windmill depends on its accommodation by the invisible, frictionless space within the air and between the shaft and propeller blades as well as on the assimilation of energy by both the propeller and the walker. We could illustrate this by asking, 'so what is driving the rotation of the windmill, or is it driving itself?' To the latter question, we would say, 'of course not!' Yet in so saying we would be recognizing that the apparent free-wheeling movement of the windmill is not and could not be driven by its own solid 'self centre'. Rather, it originates non-locally and is brought to a focus around a central hole via the spiral-form of the propeller blades, which themselves were initially 'forged into place' during the manufacture of the windmill rather than pre-existing. We might then suggest that the 'elsewhere' driving the windmill is actually the walker, motivated by his internal purpose or 'free will', whereupon our enquiry might again stop short of requiring any further explanation. But this magical pre-existent internal driver makes no sense at all if we reflect that the walker has no independent existence, but is formed and motivated through non-local influence in the same way as the windmill. Ultimately, we may conclude that the source of all apparent movement is 'everywhere' and cannot be located at some fixed object centre or hub that radiates rather than receives power. I will consider this further later on in the book.

The reciprocal spatial transformation accompanying the immersion of a body in a fluid was, of course, at the heart of the insight famously said to have induced Archimedes to jump out of his bath and run naked down the street crying 'Eureka'. Similarly, the dynamic interfacing of convex with concave domains was at the heart of the spiral transformations devised by Archimedes in his inventions of the screw and propeller, as represented in the blades of the windmill. But whether Archimedes appreciated the implicit spatial inclusion at the heart of his insight, I rather doubt. His work, anticipating Newton's, on how to reduce curvature into discrete linear intervals in order to calculate the area and circumference of a circle suggests otherwise.

Of course, you may think that the reciprocal transformation of a weightless, zero-viscosity fluid accompanying an apparently moving embodiment of itself is of little consequence on the scale of our everyday human existence, and in some senses you would be right. This is why Newton's laws of motion provide an excellent approximation in predicting and plotting the trajectories of relatively large, solid bodies like cannonballs, spacecraft, moon and planets. These laws fail to be so predictive, however, whenever the relative solidity of bodies decreases, as in all kinds of relatively mobile fluids (e.g. 'bodies of air, water, etc) and at subatomic ('quantum') scales. Moreover, they cannot account for the behaviour of three or more bodies moving under one another's simultaneous mutual influence (i.e. inhabiting common space) - the so-called 'three body problem'.

The three body problem is apparent even with such seemingly hard objects as billiard balls arrayed on a pool or snooker table. Here, whenever the assimilation of energy supplied through a player's cue that is attracted via the ball's surface to its relational centre of gravity, moves one ball, the shape of possibility space everywhere on the table transforms. This irreversible transformation is experienced locally, from the perspective of each ball, as a unique shift in the

opportunity to access the attractive space of a pocket. To a detached external observer unaware of the accompanying transformation of space, it might appear that when one ball moves everything else stays the same – but this is patently not the case. Similarly, a game of football experienced uniquely by each player as an ever-changing field of opening and closing possibilities, seems very different when seen by a spectator in the grandstand purely as a complex set of transactions or exchanges.

The dynamic interfacing of convex (viewed from ‘outside’ in) with concave (viewed from ‘inside’ out) domains is very familiar to artists. Artists’ appreciation of the relationship of the positive space of figure with the negative space of ground, makes it possible to give primacy to the latter in order to draw faithfully in proportion. By shifting the focus of attention from figure to ground, it is possible to avoid the inevitable distortions that arise from focusing on the figure alone, and arrive at a deeper awareness of how the latter is placed. Moreover, this shift of attention is thought to involve increased activity of the spatially aware, verbally inarticulate ‘right hemisphere’ of the brain, relative to the analytical, more articulate, ‘left hemisphere’.

So, in terms of developing contextual awareness, the windmill exercise illustrates a valuable mental technique, which can aid our enquiries through the cultivation of an inclusional attitude of mind. Whenever you find yourself (as I often do) describing or explaining a phenomenon in a simple, linear, cause and effect way, which focuses purely on the explicit actions and reactions (transactions) of local content in a fixed frame of reference, ask yourself ‘what else is happening?’ Then shift your attention to the big picture of the contextual field in which the phenomenon emerges. With practice, this call upon your inner artist will help to break you out of the paradoxical, self-referential, positivist loop of orthodox, impositional logic.



Henri Poincaré, whose theory of relativity preceded and exceeded in scope that of Einstein, appreciated these issues only too well. 'Space,' he stated in his *"Science and Hypothesis"*, 'is another framework we impose upon the world . . . here the mind may affirm because it lays down its own laws; but let us clearly understand that while these laws are imposed on *our* science, which otherwise could not exist, they are not imposed on Nature.....Euclidian geometry is . . . the simplest, . . . just as the polynomial of the first degree is simpler than a polynomial of the second degree. . . . the space revealed to us by our senses is absolutely different from the space of geometry.' Here, in effect Poincaré was saying that the mathematical structure we impose on space is unlike the space that we experience, which provides possibility for movement and communication.

Einstein, by contrast, continued to take a detached, objective view of space, as is implicit in his contention that 'the environment is everything that isn't me' and his famed imagining of travelling *on*, rather than *in* a light beam. Correspondingly, he retained the concept of the 'Ether' as the medium for light, as in his statement in *'Ether and the Theory of Relativity'*; 'This space-time variability of the reciprocal relations of the standards of space and time, or, perhaps, the recognition of the fact that "empty space" in its physical relation is neither homogeneous nor isotropic, compelling us to describe its state by ten functions (the gravitation potentials  $g(\mu, \nu)$ ), has, I think, finally disposed of the view that space is physically empty. . . . The ether of the general theory of relativity is a medium which is itself devoid of 'all' mechanical and kinematical qualities, but helps to determine mechanical (and electromagnetic) events. . . .Recapitulating, we may say that according to the general theory of relativity, space is endowed with physical qualities.'

So, unlike Poincaré, who dismissed the notion of detached space altogether, Einstein substituted in the idea of space as a medium *in itself*. This would be like speaking of water as 'a solvent', independently of the presence of 'solute'. But really, water can only accurately be described as a 'solvent', and hence as as

attractor, when it includes 'solute' - the identity of each is given only by the presence of the other. Correspondingly, Einstein's imagery was perhaps more of light (and matter as a condensation of light) floating upon and deforming the surface of space-time than of light *dissolved*, to varying degrees, in space. Hence the popular metaphorical representations of gravity arising through the influence of material bodies rolling around and dimpling a rubber sheet, where the sheet is an exclusion of/excluded by the body. In other words, the neighbourhood of the body does not include the body itself, just as Einstein excluded himself from his environment. He was treating electromagnetic information as an abstraction from rather than a dynamic inclusion of space and so missed the essentially interdependent, mutually shaping relationship of the couple. Ironically, he was regarding his gravitational focus of non-local influence as the hard core centre of a fixed object, himself. I have come to think that this kind of abstraction is the fundamental stumbling block of the rationalistic scientific tradition, which lives on in the paradoxes and inconsistencies that to this day beset its application in real world social and environmental contexts. Perhaps Einstein only partially or 'one-sidedly' understood the full meaning of relativity that Poincaré appreciated.

The relation between the work of Einstein and his predecessor, Poincaré, the former (at least partially) rationalistic, the latter fully inclusional echoed in many ways the relation between the work of Newton and his predecessor, Kepler. Newton acknowledged the lack of universal coherence implicit in his belief that matter consisted of 'solid, massy, hard, impenetrable, moveable particles' and his associated notions of fixed space and absolute time. But he chose to leave understanding the necessary non-material co-ordinating agency to the domain of God or future philosophers, as is evident from the author's preface to *'Philosophiae Naturalis Principia Mathematica'*: 'I wish we could derive the rest of the phaenomena of nature by the same kind of reasoning from physical principles; for I am induced by many reasons to suspect that they all may depend upon certain forces by which the particles of bodies, by some causes hitherto unknown, are either mutually impelled towards each other, and cohere in regular

figures, or are repelled and recede from each other; which forces being unknown, philosophers have hitherto attempted the search of nature in vain; but I hope the principles laid down will afford some light either to this or some truer method of philosophy'. He also commented that 'This most beautiful system of the sun, planets, and comets, could only proceed from the counsel and dominion of an intelligent and powerful Being'.

Kepler, on the other hand, saw space itself as God (or, more appositely, Goddess or Godhead), the great co-ordinating, harmonizing geometric influence orchestrating the 'Music of the Spheres'. As he said in his '*Memoir*' (cited in '*The Sleepwalkers*', Arthur Koestler, p. 264): 'Why waste words? Geometry existed before the Creation, is co-eternal with the mind of God, is God himself (what exists in God that is not God himself?); geometry provided God with a model for the Creation and was implanted into man, together with God's own likeness --- and not merely conveyed to his mind through the eyes.'

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Ultimately, *no thing* in physics makes sense when space is dynamically included in form; but *nothing* in physics makes sense, and *everything* in physics makes nonsense, when the space that permeates *everywhere* is excluded from view.

### ***Stating the Obvious - When Evidence of Absence is Evidence of Presence***

Nothing I have said so far is based on new scientific knowledge or calls for conjecture about supernatural forces, extraterrestrial life etc. It all seems rather obvious common sense to me, and that's also how I've found many other people, especially students, view it when they give me the chance to explain and discuss the ideas carefully with them. No one has yet been able to refute my reasoning or

my premises. Why then do my fellow scientists regard what I am saying as so controversial? Why do they not incorporate it into their own practice and communications, preferring instead to maintain a hard line attitude? Why, as a world community do we persist with this attitude, which engenders so much psychological, social and environmental damage?

I have already spoken of the 'one-way filter' that maintains the hierarchical power of the Vampire Archetype. Now I want to look a little closer at the psychological nature of this filter, through which people can admit - and indeed lay claim to - implicit understanding, whilst at the same time opposing its implications.

Most fundamentally, I suspect that the one-way filter operates by controlling what is admitted as 'evidence', enabling us to turn a 'blind eye' to the blindingly obvious. As I have said already, inclusionality is fully consistent with the scientific finding that physical space permeates everywhere, and with the findings (if not the initial premises or explanations) of relativity theory, quantum mechanics and non-linear dynamical systems theory. In other words there is ample implicit evidence for the vital presence of absence. But this evidence is unlike the kind of explicit evidence sought through orthodox logic, which dismisses 'evidence of absence' as 'absence of evidence', focused purely as this logic is on tangible presence, so-called 'hard', 'material' or 'solid' evidence.

The very nature of what is regarded as 'evidence' is itself dependent on logical premise. The inadmissibility of implicit evidence - evidence of the presence of absence, buttresses the discrete presupposition of impositional logic, rendering it forever closed to the possibilities included in space. Impositional logic cannot accept what it defines as outside its frame of reference. The only way in which this intransigence may be relaxed, is evident in the story of Doubting Thomas, who had to *feel* the *holes* (the presence of absence) in Christ's body in order to believe in the Resurrection.

So when I try to articulate our ideas about inclusionality, based on feeling the physical presence of space, I often find myself being asked 'where is your evidence'? But when I answer 'everywhere', this is treated as inadmissible. Meanwhile, those who regard implicit evidence as inadmissible provide no explicit evidence for the presence of a fully discrete limit anywhere in nature. The one way filter can be a frustrating place to encounter!

When faced with this kind of impasse, my recourse is not to continue battering my head against the wall trying to satisfy the demand for solid evidence, but rather to ask 'what makes sense?' In other words, the evidence I look for is consistency, because the hallmark of one-sided argument is its implicit double standard, as highlighted by the Cretan Liar paradox and its derivatives. In these terms, *any* fully definitive statement that declares an absolute demarcation between one thing and another by excluding spatial continuity produces paradox and has no explicit or implicit evidence to support it. Any attempted refutation of inclusionality has this definitive form, corresponding with the law of the excluded middle, and is thereby untenable: to dispute inclusionality it is necessary to propose that things can be defined as absolute exclusions of space. By the same token, any 'falsifiable' proposition or hypothesis, what the famous philosopher of science, Karl Popper, regarded as the very foundation of the scientific method, is inherently untenable. Inclusionality makes sense in the dynamic world of our experience. Non-inclusionality doesn't.

### ***Osmosis - The Realm of Positive Negativity***

Organic life, as it appears on Earth as an embodied water flow, revolves around a very remarkable and, to me at least, mind-boggling phenomenon - osmosis. In this phenomenon I think it may be possible to gain a clearer insight into how the inclusion of space, as a zero viscosity fluid, participates in the dynamics of the Universe from microcosm to macrocosm.

When I was first introduced to this phenomenon at School, I found it incomprehensible from the perspective of the particulate worldview that my teachers used to explain it. Yet these teachers seemed perfectly happy both with the existence of the phenomenon and with their incomprehensible explanation of it. They didn't seem to see it as challenging the very principles of orthodox logic and mathematics that they clearly had great faith in and were trying to instil into the likes of me. I found this very worrying because my elder sister, who studied biology six years ahead of me, reliably informed me that this was perhaps the most important phenomenon to understand if I wanted to be a biologist. I desperately wanted to be a biologist, so I really did need to understand the curious world of counterbalancing interdependent, mutually co-creative, inner, outer and intermediary domains in which the phenomenon of osmosis becomes apparent.

If a sugar lump is dropped into a glass of water, the sugar dissolves and its molecules disperse via the process of *diffusion* until their concentration becomes uniform throughout the water. At least, that's the usual description of what happens, along the lines I was told at School. If, on the other hand, a living cell, or piece of living tissue is put into the glass of water, the sugary solution within the cell or tissue will stay put, whereas water will flow into the cell or tissue by the process called *osmosis*. In the case of plants and fungi, the inflow of water results in a tendency for the cells to expand, which is counteracted by the resistance of their surrounding 'cell wall'. This results in the build up of internal 'pressure', analogous to that in a car or bicycle tyre, known as 'turgor'. Ultimately the expansion of the cell ceases when the resistance or 'inward pressure' of the wall exactly balances the outward pressure of the cell contents, and the cell is described as 'turgid'. It is as though the cell sucks water in until its containing boundary can expand no further.

So, in one situation solute particles are described as moving outwards, from high concentration to low concentration, whereas in the other, solvent (water) molecules are described as moving inwards from more dilute to less dilute solution. What could account for this difference? Actually, there is no difference between the two situations in terms of the process that is occurring; what differs is the frame of reference within which this process is being observed and interpreted.

What makes the difference between the two situations is the presence of a one way filter, in the form of the membrane between the insides and outsides of living cells. This membrane is 'semi permeable' in that it allows passage of water molecules but not solute. In both situations, water flows inwards from more dilute to less dilute locations, but the reciprocal outward displacement of solute from more concentrated to less concentrated solution is constrained by the presence of the cell boundary. In the absence of this boundary our objective human attention tends to focus on the solute particles moving from more dense to less dense locations as if being forcefully repelled by one another.

Without the filter in place, we are hence prone to impose our own reference frame and so, in the same way as revealed by the windmill exercise, to *lose sight of* the reciprocal influx of solvent that accompanies the outward displacement of solute. In the presence of the retaining boundary, however, our attention flips to the apparent movement of the solvent. So we find our attention shifting back and forth between content and context in a way that can seem very inconsistent - which is what confused me when I was first introduced to the phenomenon at school.

On the other hand, if we allow our attention to be drawn primarily by the distribution of the solvent, what becomes apparent is the relative affinity or attractiveness of the more internally informed for the less internally informed fluid. In water, this affinity is technically described as osmotic potential, and it has a

negative value referenced to a 'pool of pure water' of zero potential. Water is hence attracted to places with 'more negative' potential, which gives rise to a positive osmotic or turgor pressure when these places have a restraining boundary that limits reciprocal displacement of solute. It may be possible to think of this kind of reciprocal relation between fluid spatial context and dynamic informational surface as a universal phenomenon, operating over all scales of organization.

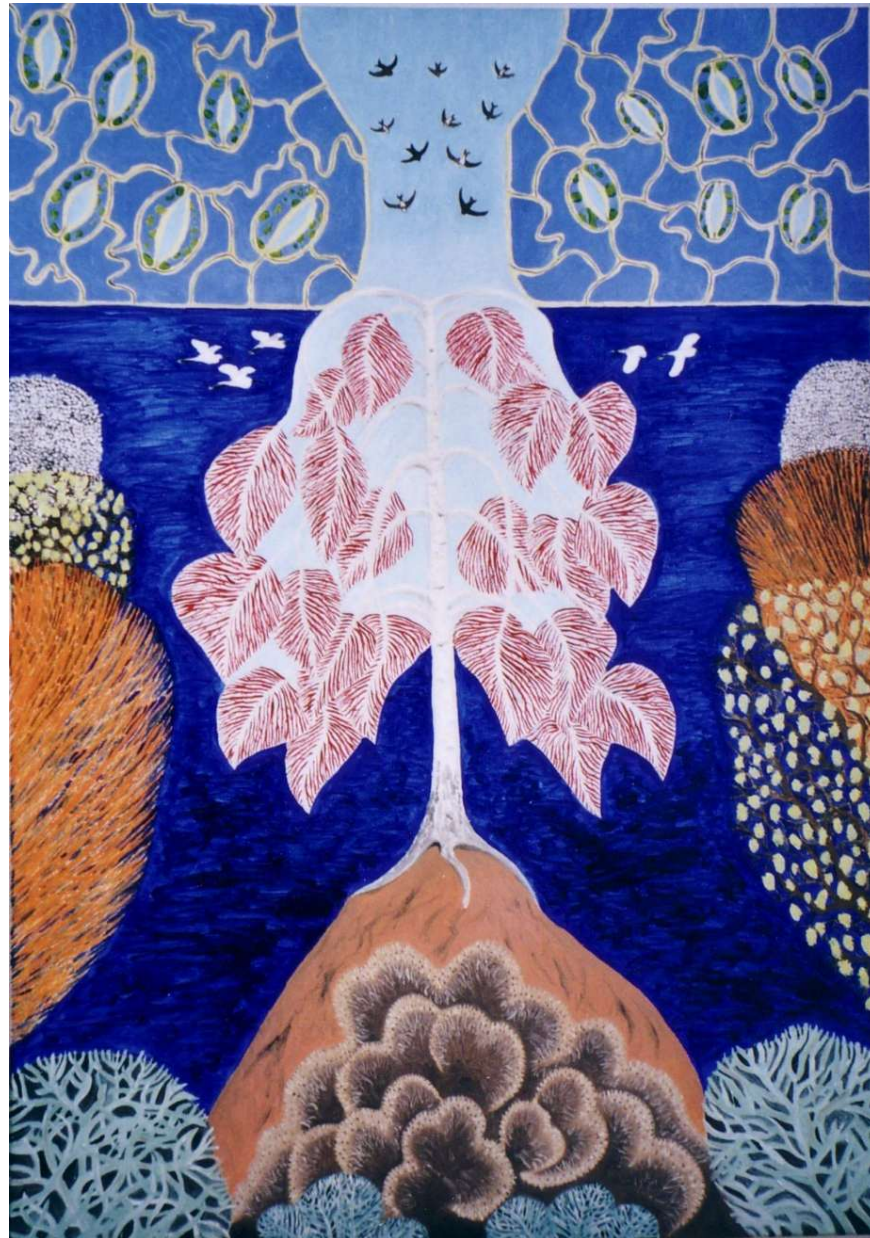
### ***Breathing Space - Inspiration and Expiration***

In March, 2002, I visited Karlstad in Sweden, to participate in a debate about the nature of life and life forms. Rather than keep me permanently confined to the grey, box-like lecture rooms where I met and discussed ideas with her colleagues, my host recognized that my eyes and lungs were longing to take in some of the surrounding scenery. So she took me out exploring.

For at least part of my stay, the weather was brilliantly sunny, but very cold. The lakes were still frozen in places and huge icicles draped down the steep banks alongside the roads we travelled. My host asked me what inspired my paintings. I looked around and immediately knew what my next painting would feature.

When I returned to England, the latent Spring I left behind a few days beforehand had been released from wintry confinement into the exuberance of regenerating life that has never ceased to take my breath away since I left the tropics for the temperate zone. My wife, Marion and I visited a local wetland nature reserve where the sights of bursting leaf, flower and catkin melded with the flights, splashes, calls and swimming of waterfowl. Towards the end of our visit a metallic twittering attracted our attention to the swoops and spirals of a party of sand martins, newly arrived from migration. It wasn't long before I painted the picture shown in Figure 4.





**Figure 4. 'Breathing Space'** (By Alan Rayner, Oil on Canvas, 2002). *Spring IS Inspiring. New leaves open stomatal windows to sky. Sand Martins - small swallows - swirl down from migration towards water. Egrets flutter past. A white-ribbed Silver Birch, rooted to rocky diaphragm, transforms crimson lung-branches into leaves. Coral bark fires imagination. Pussy Willow erupts into*

*incandescent catkins. Blackthorn snow-storms. Lichens pulsate with their own slow rhythm. Space moves within and without the embodied water flows of life. In, out, together, to gather. Implicit Human Being. In Formational Lining. Attuned.*

The rhythm I am expressing here is at the heart of life, the manifestation of that dynamic, reciprocal relationship of inner with outer coupled through intermediary domains that waves and resonates everywhere, from microcosm to macrocosm. The breath of life is the breathing of ever-present living space, continually transforming. As we breathe in, the outside breathes out into our receptive space. As we breathe out, the outside breathes in from us. Breathing in, we become inspired, responsive. Breathing out, we expire, relax, and become receptive. To exclude space is to stifle this breathing and reduce the world into objects like Newtonian bodies and neo-Darwinian 'units of selection' that lack vitality and so are buffeted around in equal and opposite reaction to the action of external forces. The fish that swims only with the current, so they say, is a dead fish. To remove or seal the dynamic, holey boundary that both adjoins and distinguishes inside and outside, is to dissolve or inhibit the creative potential so that all either becomes a lifeless, featureless unity or is split asunder into antagonistic pairs.

To get a mental picture of how rhythmic patterns can arise from the reciprocal dynamic coupling of inner and outer space phases mediated through a permeable, deformable intermediary boundary (spatial 'stiffening/yielding' zone) I find it helpful to imagine a balloon, whose rubbery skin is full of holes. As fluid is transferred from outside to inside the balloon, so the holes in its inflating surface enlarge and release more and more contained fluid. The boundary expands until, providing the rate of input is sustained, a balance is reached. Here output and input are equal and the surface is held stationary in *dynamic equilibrium*, in the same way as the turgid cell whose uptake of water by osmosis is balanced by loss across its membrane and wall. If, however, the rate of fluid input exceeds a threshold amount, then the counteraction between the tendency of the balloon to

expand as it gains fluid and to contract as it loses fluid through its enlarging holes, sets up a repetitive oscillation between alternative surface distributions. This oscillation, or cycle of 'waving correspondence', increases in complexity as input is raised further. The number of oscillations between repeats doubles and redoubles until yet a further threshold is reached. The balloon boundary then reconfigures apparently erratically and without ever repeating itself, like a fibrillating heart or turbulent body of fluid.

This imagery corresponds with the patterns predicted by a relatively recently developed branch of mathematics, known as non-linear dynamical systems theory (which encompasses its more popularly known subsets, chaos theory and complexity theory). This theory is based on non-linear equations. These contain negative feedback terms that restrict a trend for amplification towards infinity when the equations are repeatedly iterated (i.e. when their solutions or outputs are fed back as inputs to calculate a further output). In other words, these equations generally simulate the counteraction between a drive for expansion or growth (resulting from iteration) coupled to an increasing tendency for resistance to or dissipation of further input, much as in the leaky balloon.

A well-known, relatively simple example of a non-linear equation on these lines is the 'logistic difference equation'. This equation relates the actual number of entities ( $x$ ) as a proportion of the maximum possible number (1) in a current population to the number of entities in the next generation ( $x_{\text{next}}$ ) in terms of the net rate of reproduction ( $r$ ) per head of population as follows:

$$x_{\text{next}} = rx - rx^2$$

where  $x$  varies between zero and 1.

Here, the potential for increase in  $x$ , due to the reproductive drive,  $r$ , resulting from resource acquisition is countered by the negative feedback term,  $rx^2$ . When this equation is iterated (i.e. when the output  $x_{\text{next}}$  value is used repeatedly to

input the next  $x$  value) from some low initial positive value, the  $rx^2$  term increasingly inhibits the increase in  $x$ . When  $x$  is equal to  $1 - 1/r$ , representing the 'equilibrium population size' or 'carrying capacity' of the population, there is no further expansion.

For values of  $r$  between 1 and 3, the equilibrium population size ranges from zero to  $2/3$ . The increase in  $x$  from low values either leads directly to attainment of the equilibrium value if  $r < 2$ , or, if  $r > 2$  to a series of progressively smaller fluctuations (i.e. 'damped oscillations') above and below the equilibrium value. For values of  $r < 1$ ,  $x$  becomes zero.

For values of  $r > 3$ , however, the population is driven over a threshold where it becomes unstable. Here it is unable to attain a single equilibrium state (known as a 'fixed point attractor in 'phase space'), unless arriving by some infinitesimally small chance at exactly the requisite value of  $1 - 1/r$ , and instead subdivides or 'bifurcates' into a series of alternative states. Here, as  $r$  is increased,  $x$  values come to oscillate around first two, then four, then eight ...  $2^n$  values in a so-called 'period doubling' cascade. At  $r = 3.57$ , deterministic 'chaos' first becomes evident, as  $x$  values vary non-repetitively and at  $r = 4$ , all  $x$  values between 0 and 1 become possible.

Note here that the 'chaos' produced via the logistic equation is described as 'deterministic' because all the 'initial conditions' are fixed and there is a pre-set limit that the system cannot exceed. The system is effectively contained within a fixed boundary and its behaviour can be predicted with complete certainty so long as the initial conditions are known *precisely*. The fact that in reality the initial conditions can never be known precisely, and even tiny changes in initial conditions can be amplified by feedback into huge changes in behaviour (the 'butterfly effect'), makes the behaviour unpredictable in the longer term. This unpredictability or uncertainty is not, however, regarded as 'stochastic' (i.e. due to randomness in 'open space') because the system is fully defined. But wait – isn't

there an inconsistency here? In fact the system depends on the presence of open space because energy has to get inside from outside in order to drive the system and this energy can be dissipated through negative feedback (expanding holes in the balloon model). Space has got in through the back door – the supposed determinism is in the modelling assumptions using discrete numbers, not in the model itself. The non-linearity results from the inclusion of space. In fact that's what non-linearity most fundamentally implies – the dynamic inclusion of space. And in real systems such non-linearity is primary, not a secondary product of forcing a primarily linear system.

There are three further reasons why the balloon model is both limited in itself and exposes the limitations in current non-linear mathematics.

Firstly, as already mentioned, it starts with a 'given' set of 'initial conditions' – a fixed amount of 'material' in the balloon's skin, a fixed 'holeyness' of the skin and a fixed rate of input: in effect a self-contained, fixed set of Rules imposed for all time. The story begins in an instant with no historical or future contextual influence. But what if more material can be added to the skin as the balloon expands, or if its 'holeyness' can be altered as its circumstances change? We would then have a truly dynamically bounded or indeterminate system of the kind widely found in real life, like a growing fungal hypha, tree, blood vessel or nerve cell.

As an example of a real life system, let's consider a fungal hypha growing in wood. The wall of this tube-like structure has a deformable, dome-shaped tip, which elongates as wood substance is effectively transferred from its 'outer space' through gaps to its inner space. Like a river eroding its way into landscape and depositing sediment, the hypha opens, closes and follows paths of least resistance (spaces) in close correspondence with its inseparable dynamic context. Branches form in this system whenever input exceeds throughput capacity to existing points of deformation on its informational boundary. These

branches may form in a tributary-like pattern at or near sites of input, or in a delta-like pattern remote from these sites. Initially they are 'dendritic' (divergent from one another) and so linked 'in series', such that their internal (hydraulic) resistances to throughput (current) combine additively. But the branches can also fuse ('anastomose') when their self-created holey envelopes coincide, converting a dendritic pattern into a parallel-distributing network with hugely increased internal conductivity. Now the system can produce mushrooms, transcending its previous limitations and operating on a greatly amplified scale, like a river in flood or an erupting volcano supplied by anastomosed larva channels. We see here, then, how the variable fluidization of its boundary enables a dynamic system to *evolve*, both changing and being changed by its dynamic context and scale of operation.

The second limitation of current non-linear mathematics exposed by the balloon model, is related to the first as it concerns the problem of imposing a discrete time-scale, independent of space. This problem is implicit in the use of algebraic formulations based on an underlying system of discrete (independent) numbers. The simulated dynamics are then necessarily referenced to sequential time (hence the term 'feedback'), even though it is clear from the balloon example that the reciprocal transformations in inner and outer space, through their convex/concave dynamic interfacing, are *simultaneous*. As the surface informing inner and outer space moves in response to input or output, so *both* inner *and* outer space reconfigure.

The third limitation is that the balloon example concerns only *one* inner space, outer space and informational boundary. In reality, as far as the human imaginative eye can see, it is clear that informational boundaries are nested in many-layers, essentially in triplicate. Every inner space within an outer space is also an outer space enveloping an inner space of smaller scale, from sub-atomic to universal. I will return to this issue later.

## Death As a Way of Life

As my dream about the boomslang may reveal, I am scared of death, and would very much like to exclude its possibility from my own and my loved ones' lives. I do not relish the idea of death as an annihilation of the individual - as it is wont to be regarded in eliminative 'survival of the fittest' models of evolution. Nor do I fancy the idea of an eternal afterlife if the avoidance of pain in that realm is contingent on being 'good enough' in this one. Viewed impositionally, death is an absolute boundary with a finality all of its own. It is a severance from existence and/or a place of awesome Judgement that makes life seem either pointless or a fearful trial in which even the most heavenly prospect comes loaded with potential damnation of one's Self and one's life's companions.

Viewed inclusionally, however, death seems to me like no more and no less than the ultimate expiration from inner to outer, the release of spatial potential for reconfiguration into new forms of correspondence between content and context in an ever-changing realm. It is nothing more and nothing less than the subsidence of flow-form into a place of deep calm from which new forms can emerge. That's how it seemed as my mother, after hours of laboured breathing, let go her last sigh. I find solace in this view, a sense of 'opening ending', of the kind shown in Figure 5.





**Figure 5. 'Opening Endings'** (By Alan Rayner, Oil on Canvas, 1999). *An elm tree's demise, its wing-barked boundaries opened by ravages of bark beetle and fungus, makes way for new life to fill its space. Maple leaves take over the canopy between earth and sky, but their coverage is only partial, leaving openings for arriving and departing flights of woodpeckers. Fungal decay softens the wood to allow the tunnelling of long-horn beetle larvae and probing and chiselling of beak-endings. A nest cavity provides a feeding station between egg and air.*

This sense of death as an inextricable aspect of the vital inclusion of space in life, is perhaps most obvious in plants and fungi, whose *absorptive* means of gathering in sources of energy is associated with an *indeterminate* pattern of development. Here, the body can potentially expand indefinitely, rather than



attain a more or less specific adult size, as occurs in many animals, which move from place to place in search of energy sources to *ingest*.

In these indeterminately developing organisms, the role of local death as a means of feeding, supplying and protecting larger life comes in many guises. It appears in the ageing of leaves as they release their stores of nutrients and lose their greenness prior to their abscission and fall. It appears in the formation of wood, as a water-conducting system of open spaces, lined with strengthening walls, derived from dying cells in the core of stems and roots. It appears in the death of the centres of spreading plants and fungal fairy rings, which releases their margins to travel inexorably outwards. It appears in the way that local death of cells and tissue protects from incursion by parasites and other destructive agencies. And so on.

Death plays the same vital roles in animal bodies and communities - it just takes a little more imagination to see it. The consumption of one organism by another is the basis of so-called 'food webs' that underpin the diversity of natural communities. The metamorphosis of larvae into adults, whether these be tadpoles into frogs or caterpillars into butterflies involves what can be a huge redistribution of resources from dying into living form. An intrinsic feature of the development of many animals is the process of 'programmed cell death' or 'apoptosis'. This process ensures the cells do not outstay their welcome and become cancerous (cancer is produced by potentially 'immortal' cells that in clinging to life drain the corporate body on which they ultimately depend).

A remarkable example of the 'making of space' by programmed cell death in the life of a plant is found in the moss *Sphagnum*, which inspired the painting shown in Figure 6.



**Figure 6. 'Sphagnum Moss'** (By Alan Rayner, Oil on Canvas, 2003). *A labyrinthine network, Of Life, In a matrix of death; A close interdependence, Of One with the Other, Fills Like a Sponge, With Water, Or Blood; Cushioning; Soothing; Healing; Filtering; Raising Ground out of Water, For others to root in, Building on the Backs, Of past endeavours; Death Feeds Life, In a succession, Of amplifying Diversity; But a distanced humanity, Walled Into Itself, Feeds Death With Life*

The leaves of *Sphagnum* contain two kinds of cells: a set of green (photosynthetic), elongated cells linked together in a network of channels around a matrix of dead, empty cells, formed by programmed cell death. The latter cells readily take up water, like a sponge, and can hold as much as twenty times the dried out weight of the plant. As a result, *Sphagnum* turns open water into bogs in which other plants can take root, resulting in a succession that can eventually lead to woodland. The dead remains of the *Sphagnum* forms peat. *Sphagnum* also can be used to treat human wounds, due to its ability to soak up blood - it is sometimes called 'blood moss'. In the painting, I contrast the life-supporting role of death in *Sphagnum*, with the feeding of death with life that results from human ideological conflict.

### ***Feeling the Heat - The Thermodynamics of Spatial Inclusion***

One of the most extraordinary tales of death and deconstruction that fascinated me at school, was the notion of the 'heat death of the Universe'. This stems from the second law of thermodynamics, a fundamental Physical Law, which I was told no scientist could ever dispute without revealing themselves to be a fool. According to this Law, everything in the Universe is dead set on an irreversible course to pure disorder or randomness. This utterly incoherent state of maximum entropy is understood in statistical terms as being like an infinite pack of shuffled cards, from which the emergence of any consistent order (such as a flush) is ultimately impossible. However, such a conclusion, whereby irreversibility is understood as the consequence of progressive degradation of structure appears to contrast with the notion of biological evolution of complex structure from simple foundations. This apparent contrast has been the subject of a lot of scientific debate. Ultimately it may be an example of the kind of paradoxical inconsistency that arises from the rationalistic imposition of discrete limits around and within dynamic systems.

The second law of thermodynamics was deduced from studies that showed that heat engines could never be 100 % efficient because heat cannot flow from a cooler to a hotter body unless 'work' is done, although in the absence of 'insulation' it readily flows in the opposite direction. This means that in the process of heating a body from the outside, some 'useful' energy (i.e. coherent 'free energy' or 'exergy', the capacity to apply 'force' through a distance and hence do 'work'), is irreversibly leaked or dissipated back as heat to the outside via the body's boundary. In an *isolated* system, *defined* as a collection of matter unable to exchange energy or matter with its outside, all irreversible change therefore entails a net degradation of energy from coherent into incoherent form and a corresponding increase in entropy. Reversible changes, by contrast, involve zero change in entropy.

All of this begs the questions of what is 'heat', how does it differ from other forms of 'energy', and how relevant is the notion of an 'isolated system' to the real world and Universe? Reflecting on these issues, I cannot avoid inferring that current thermodynamic theory is an artefact of imposing space-excluding definitions upon reality. These definitions arise from classical Newtonian mechanics, which do not account for the dynamic reciprocity of inner and outer through intermediary domains and hence make no consistent sense. Heat, and heat exchange, cannot be understood as a property purely of electromagnetic energy/matter abstracted from space. They can, however, readily be understood as a property of space in dynamic relation with electromagnetic information, in much the same way that osmosis can be understood as a property of solvent in dynamic relation with solute.

My feeling is that if we regard the inclusion of space within a dynamic system as the basis for an expansion of possibility for movement, then this can clearly explain a perceived increase in temperature within the system. As illustrated by the leaky balloon metaphor I described earlier, the transfer of heat from outside to inside a system can be understood as a process of in-breathing (inspiring)

space. It leads to expansion, counteracted by the enhanced tendency of the system's dynamic boundary to leak and contract. By the same token, the contraction of a system as it cools can be understood as out-breathing (expiring) space. Similarly, compression (application of suffocating pressure) of the system from outside will have the effect of concentrating internal space and a corresponding increase in temperature, whilst tensioning of the system (application of vacuum) will draw out internal space, lowering the temperature.

The upshot of linking thermodynamics inextricably with spatial dynamics is the emergence of a very different view of a dynamic system, one that aspires towards inner-outer dynamic equilibrium, a condition of harmonic balance, rather than the ultimate disintegration apparent from a one-sided, space-excluding view.

### ***Attunement - A Dynamic Balancing Act***

By contrast with the orthodox, space-excluding view of thermodynamic equilibrium as an incoherent 'slough of despond' from which there is no escape, the inclusional view of 'dynamic equilibrium' is an exhilarating high-wire act, oscillating between reciprocally coupled potentials. In the inclusional view, stasis is located in the still place where inner and outer potentials exactly balance. As such, although it may be approached, is impossible to find and/or sustain. This is because the slightest deviation will engender a ripple of movement and counter-movement. Far from being the default condition of the Universe, which can only be shifted through the application of external force, stasis is therefore the unattainable, ever-present attractor around which the Universe revolves from microcosm to macrocosm. Meanwhile, by pushing one-sidedly against this balance, through the exclusion of space, humankind may be pushing towards catastrophe as a self-fulfilling prophecy of its own deepest fears of annihilation.

Inclusional dynamic equilibrium, or 'spatiothermodynamic equilibrium' is hence about as far from thermodynamic equilibrium as one can get. It also differs from the notion of self-organizing, far from equilibrium, dissipative systems at the 'edge of chaos' developed by Nobel Prize-Winner, Ilya Prigogine, during the latter part of the last century, which became a hallmark of Complexity Theory. This notion arose from recognition that systems at or near thermodynamic equilibrium have little or no capacity to generate complex form. If the second law of thermodynamics was not to be flouted, the emergence of complex form, such as that produced by biological evolution, could only be explained by the occurrence of 'energetically open systems'. By gathering in sources of energy these systems effectively generate a large potential difference between their insides and their outsides, which they dissipate to the outside through the proliferation of their informational surface, hence maximizing entropy gain overall. The generation of structural 'order', apparently 'out of chaos' is consequently seen as a natural, 'self-organizing' way of ensuring transit to the heat death of the Universe.

Much as I was attracted by these ideas about the emergence of complex forms, as dissipative systems far from thermodynamic equilibrium, when I first heard about them, they didn't make any consistent sense in my mind. They seemed to contain too many internal contradictions, due to the hard-line imposition of a one-sided view of complex systems. 'Chaos' was conflated on the one hand with structural complexity and heterogeneity with randomness on the other. Randomness was treated as 'homogeneous', even though, as I will discuss elsewhere, it is so only as a global 'average' and is actually extremely heterogeneous at fine scales. 'Order' was conflated both with homogeneity and with structural complexity. The double standards of the Vampire Archetype were being applied everywhere, indeed dissipative systems are themselves powerful representations of this Archetype and its devastating potential. Moreover, the representation of life forms purely as dissipative systems seemed to me to omit

at least half (possibly much more) of their life stories, as is evident in the transformations of their dynamic boundaries.

As I alluded to earlier, my response to these inconsistencies was to view self-organization in terms of balancing what I called the 'self-differentiation' of boundary-maximizing systems in circumstances of external plenty with the 'self-integration' of boundary-minimizing systems in circumstances of external shortage. I also recognized that this dynamic balancing is mediated through the interfacial boundary. This both reciprocally couples and distinguishes outer and inner domains, which, like a river's catchment and streams, simultaneously shape one another.

This dynamic balancing of inseparable inner with outer through intermediary domains implies complementary, mutually transforming relationship and so differs quite fundamentally from the Darwinian notion of 'adaptation'. The latter implies the reaction of 'one' to the fixed frame of reference imposed by the other, which arises in turn from their dislocation rather than togetherness. I therefore prefer to use the word 'attunement' to signify this mutual, harmony-seeking relationship of correspondence of one with another. Such attunement is also evident in the physical phenomenon known as 'resonance', which amongst other things makes suspension bridges ripple and even collapse when troops march across them without breaking step.

### ***Nested Holeyness - The Dynamic, Space-Including Geometry of Nature***

The mutual correspondence of ever-transforming inner and outer via necessarily incomplete and hence 'holey' or permeable, intermediary domains, implies a fundamental dynamic geometry of Nature. This geometry extends from microcosm to macrocosm and differs radically from the hard-line abstractions of



Euclid. It is primarily non-linear or curved, due to the inductive pull of spatial attraction, giving rise to spheres, ellipsoids, spirals and tubes.

Linear structure emerges secondarily from this geometry, as in the cylinders formed by trees or the hexagonal arrays formed in honeycombs and the regular surfaces of crystals. This natural geometry is also 'nested', with smaller domains contained within larger domains. The simplest form of expression of this geometry would be a set of concentric perforated spheres, but has the potential to become extremely complex. I tried to represent this geometry of dynamic neighbourhood and the way it includes local as an expression of non-local identity over all scales in the painting and poem shown in Figure 7.





**Figure 7. 'The Hole in the Mole'** (By Alan Rayner, Oil on Canvas, 2001). *I AM the hole; That lives in a mole; That induces the mole; To dig the hole; That moves the mole; Through the earth; That forms a hill; That becomes a mountain; That reaches to sky; That connects with stars; And brings the rain; That the mountain collects; Into streams and rivers; That moisten the earth; That grows the grass; That freshens the air; That condenses to rain; That carries the water; That brings the mole; To Life*

The nearest approach that conventionally fixed-framed mathematics has made to this natural fluid dynamic geometry of 'nested holeyness' is fractal geometry. This was made famous by Benoit Mandelbrot, as a way to describe structures whose boundaries, unlike Euclidean surfaces, appear progressively more complex/irregular, in 'self-similar' patterns, the closer they are observed. Almost anything we look at in nature from clouds, to snowflakes, to river valleys, to ferns, to trees, to lungs has this property, which makes them immeasurable in terms of discrete units of length, area and volume, because how much you see depends on how close you are. For example, the length of the coastline of the Isle of Wight seems much less to an astronaut orbiting the Earth than it does to a mite crawling around its many indentations. At infinitesimal scales of closeness, the length is infinite.

These patterns can be simulated mathematically by iterating equations in the way that I described earlier. A famous example is the 'Mandelbrot set' itself, which appeared in many guises as a colourful modern mathematical art form in the late twentieth century. This set is made by mapping the distribution of points in the 'complex plane' that do not result in infinity when iterated according to the

rule,  $z \rightarrow z^2 + c$ , where  $z$  begins at zero and  $c$  is the complex number corresponding to the point being tested. Here, a 'complex number' is a number that consists of a combination of a 'real' and 'imaginary' component, the latter being a derivation of, ' $i$ ', the square root of -1. The complex plane is formed in the space defined by placing all 'real' numbers, from  $-\infty$ , through 0, to  $+\infty$  along a horizontal line, and all 'imaginary' numbers, from  $-\infty i$ , through 0, to  $+\infty i$ , along a vertical line, and using these Euclidean lines as co-ordinates. In effect, it represents a way of increasing the 'possibility space' for numbers as discrete entities to inhabit, from one to two dimensions.

The remarkable feature of the Mandelbrot set is the extraordinarily complex boundary that occurs between points within and points outside the set, in effect between an inner attractive space of zero and an outer attractive space of infinity. Such complex boundaries formed between neighbouring attractive spaces or 'attractors' have more generally been referred to as 'fractal basin boundaries', and are clearly at least analogous to the complex boundaries of natural process geometry. The conventional abstract mathematical representation of such complexity, however, *begins* prescriptively with an implicit or explicit *definition* of content and container that replaces their *simultaneous* reciprocal relationship with *sequential* 'feedback'. The natural geometry implies an intermediary realm through which inner and outer spatial possibilities are reciprocally and *simultaneously* coupled and transformed by one another. Endless creative possibility emerges.

### **3. Cross-Purposes - The Trinity of the Complex Self**

## ***Excruciation and Transfiguration***

For years and years, that schoolteacher's interpretation of the symbolism of the Christian Cross as 'I' crossed out, with his implied altruistic requirement to 'love thy neighbour' *instead of* rather than *as* yourself ('or else'), bothered me profoundly. Far from providing a safe passage *away from* the Anti-culture of Vampiric bullies and innocent victims, it seemed to draw even more inextricably *into* this culture by putting victims into a double bind. If you resist the bullies' imposition, this means you're putting the needs of your own self-identity before those of the bully. If you don't resist, you make yourself a willing victim. I suspect that many a rapist, and many a male-dominated, paternalistic and/or colonial culture has thrived, and justified their behaviour on the basis of this double bind.

When I have shared my experience of being confronted with the Self-denying symbolism of 'I' crossed out, I have found other people's reaction, both Christian and non-Christian, to be remarkably polarized. Some have reacted with incredulity - protesting that surely such an unsustainable proposition could not have been intended seriously, and if it was, then it must have been the expression of a singularly idiosyncratic view. But others, especially women, have responded with recognition. Yes, they have said, even if not hearing it expressed in those exact words, that is what they have been brought up to believe and have felt required to follow in their own life's practice of 'trying to be good', often at great personal cost.

Can this symbolism of 'I', crossed out, really be the true meaning of the Cross - a means whereby the power of external Authority can be imposed upon a sheepish population of non-self-assertive conformists? Are we really being asked to sacrifice our self-identity to some over-arching Vampiric Presence? How can this requirement relate to the other requirement we are constantly being reminded of in modern culture, to compete with others and be self-sufficient - to 'stand up for ourselves'? Do we love one another or oppose one another, which is it to be?

Such is the double standard Cross that we find ourselves required to bear in the paradoxical orthodox 'Anti-culture' of the excluded middle that we find ourselves inhabiting. A culture in which the Self, as a dynamic *intermediary* embodiment, a co-creative complementary combination of light and dark, inner and outer, individual and collective *neighbourhood gets torn apart*, like the folded sheet of paper I described in Chapter 1.

What if the symbolic implication of the Cross is not the altruistic annihilation of the 'I' Self? What if it represents the compassionate *inclusion* by and of the 'I' Self, through its holey centre and interfacial bodily boundaries, of complementary dynamic potentials? Would that make a difference to the way we relate to one another, other life forms and our living space? I think it would and does. In fact, I would go so far as to suggest that it literally *transfigures* our understanding of Self as a dynamic togetherness or neighbourhood of mutually shaping and reciprocally transforming inner and outer through intermediary spatial domains. Hence the Cross may symbolize the transfigural *opening up*, not the rigid denial, of the upright, hard-line closure of orthodox thought. But, I have never heard it described in those terms by orthodox Christians. And many have been the heretics, like Giordano Bruno and perhaps Jesus Christ Himself, put horrendously to death for daring to express anything coming close to this view. Many too have been the political and academic careers stalled by orthodoxy when they have sought to bring the iniquities of the law of the excluded middle to light.

What is it, then, that orthodoxy finds so unpalatable about this view of Self as Neighbourhood - dynamic relational place rather than dislocated individual subject or object? Does it necessarily end in catastrophe, or is it a means of avoiding catastrophe? Does it inspire love or hate? Is it healing or damaging? Does it bring us together or force us apart? These are questions I want to explore in this chapter.

### ***Compassionate Feeling: Loving Error***

For myself, I can only report that when I am immersed in that dynamic framing of mind where I am able to include space in my perceptions of the boundaries of my Self and others, I feel an enormous sense of relief and joy spreading through me. I can at last lay down that burdensome double standard that I have felt obliged to carry through my life. I begin to *see with a compassionate feeling* for dynamic context that finds a unique kind of beauty both within and relating amongst *every* simultaneously living and dying, inspiring and expiring natural form.

Gone, then, is the sense of analytical need to define, compare, measure and judge every body against some objective reference scale marked out in percentage point intervals from badness to goodness that take no account of context. Gone too is the associated eugenic notion that the world can only be made better through the elimination of badness until we are left with a 100 % monoculture of goodness that has only itself to relate to and so is incapable of undergoing or responding to change. In its place comes the realization that what we may so readily perceive from the viewpoint of the excluded observer as badness - the source of all error, confusion and uncertainty, is utterly vital to our dynamic, creative human experience. Indeed it is vital to all life. It is included in, transfigured by and a vital aspect of goodness in an ever-changing world. It is liable to be harmful only when we seek to remove it from ourselves and so fail to include and love it. Then it comes back to batter against the door we have closed against it, demanding to be allowed access. When, and if, we finally relent and give it its place, we may discover that far from being the source of sin, weakness and vulnerability that we feared, it can actually be the wellspring of loving and respectful compassion.

I have had many dreams about my own vain efforts to exclude from my personal life this source of 'badness', which Carl Jung aptly described as the 'Shadow'

Archetype. One such dream was set in the final of the Australian Open Tennis tournament (as good a setting as any for an 'inverted view', I suppose!). The Number One Seed, trying desperately to be perfect in the eyes of the crowd, tightens up, over-extends himself and so loses touch with his game - a condition often referred to in sport as 'losing form'. He keeps serving directly into the crowd and is comprehensively out-volleyed by his mercurial, supple and subtle opponent, a rank outsider or wild card. The Number One Seed has blond hair and finely chiselled features that Adolf Hitler might have admired. Notwithstanding his classical 'good looks', he has to sit silently in his chair at the Press Conference following the game and endure the salacious profanities with which he is berated by the victorious outsider, who has tousled hair and one black and one white eyebrow. Oddly, though, the Number One Seed, representing Ego, is smiling, as though knowing that he must accept the wayward intrusiveness of his Shadow opponent, if he is ever to recover his touch and regain his form.

So I feel it is the self-defeating, unforgiving, crowd-pleasing, perfectionist aspirations of goody-goody ness, not goodness, that makes a Jungian Shadowy 'sin' of the presence of absence and tries to eliminate it from human lives apart from one another and Nature. By contrast, it is the honest, joyfully forgiving, fault-including creativity of holeyness, not holier-than-thou ness, that holds this Shadowy presence tenderly in place, opening our hearts compassionately in the common pool of uncertainty that connects our human natures with one another and with all nature. Uncertainty, as a purely *relative* condition, and with it the capacity for error, adventure and discovery, is what we all really have in common. Certainty, as an *absolute* imposition, and with it the false sense of security and playing to the crowd *pretence* of 'strength' that comes from *denying* or *opposing* the presence of absence, is what divides us, bringing us into ideological conflict with one another and nature. We can be *absolutely certain* only of our relative *uncertainty*, aware of the insufferable *absurdity* of desiring *absolute boundaries* and *fixed centres* in a dynamic, ever-evolving Nature.

Seen in this Shadowy light, our love for one another is sourced in the inclusional humility of acknowledging and valuing the inevitable uncertain aspects and associated *frailties* of our lives. This we share as we seek, complementarily, to provide and relate to flexible, context-dependent 'guide linings' for one another. My friend, Jack Whitehead, might describe these dynamic guide linings as 'living standards of judgement', which account continually for context, helping us to attune with rather than ignore our ever-changing circumstances. By contrast, our hatred for one another is sourced in the impositional denial that attempts to isolate bad from good and claim sole possession of the latter, defined by absolute rules and regulations.

Here we begin to see how what we regard as 'weak' or even 'sinful' from an individual, objective viewpoint can, through its acceptance and complementation, provide great resilience in the form of collective coherence. In such ways may we love the enemy that we have made of uncertainty - and the meek truly 'inherit the Earth'.

By the same token, what is regarded as 'strong' and 'good' from an objective viewpoint imposes a rigid strength that is extraordinarily brittle and prone to shatter any form of collective organization. So, when we try, imperiously, to impose this kind of strength on our human selves and communities, we are building in the seeds of decline and fall in the very process of asserting our might, at the same time as making life miserable for those deprived of power. A wall of smooth, uniform bricks, without cementing mortar, is intrinsically unstable. A dry stonewall comprising many shapes and sizes, roughly interlocking through their common space can resist all manner of disturbance. It takes all kinds to make a world, not a monopoly of one. But our impositional Anti-culture continues to demand the rigidity of uniformity where each is as good and strong in its independent right as the other. I can only suggest that you stand well clear of its constructs if you don't want to be buried alive!



As I have indicated already, I personally have felt very keenly the demand to appear outwardly 'strong', like the Number One Seed, another brick in the wall of the academic culture in which I have been immersed. Indeed, whenever I have admitted my profound inner insecurities and sense of frailty to the 'crowd' of my peers, I have found my career path blocked and even threatened with termination. My peers have wanted another brick in their wall, not an intrusive hole, and so any such admission has rapidly been followed up with the question, 'how can we have confidence in you if you lack confidence in yourself?' To which I have answered, under my breath, 'What I lack is confidence in your mutually supportive relationship with me - denied that, my frailty becomes my individual weakness rather than my contribution to our collective strength'.

In 1998, when I was feeling this sense of contradiction and imminent collapse especially strongly, I found myself painting the picture shown in Figure 8, based on some observations I had made of the distinctive patterns of venation in a lobed ivy leaf and a heart-shaped leaf.



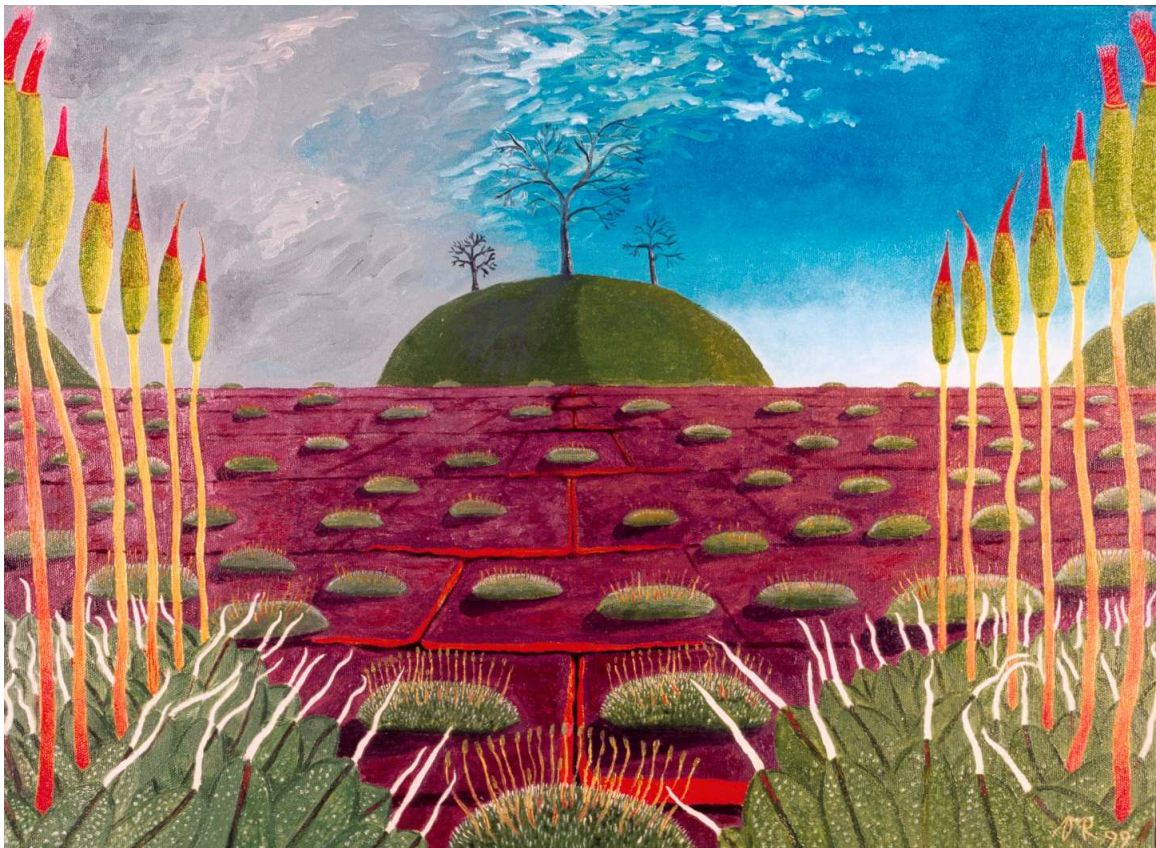
**Figure 8. 'Loving Error'** (Oil painting on board by Alan Rayner, 1998). *This painting illustrates the dynamic interplay between differentiation and integration, irregularity ("error") and regularity, and negative draining and positive outpouring that is embedded in living system boundaries. The erratic fire in the venation of a lobed ivy leaf is bathed in the integrating embrace of a heart-shaped leaf which converts negative blue and mauve into positive scarlet and crimson. The midrib of the heart-shaped leaf emerges as a bindweed which communicates between extremes of coldness and dryness.*

As I look back on this painting now, I can see my attempt, in lieu of what I felt I lacked then in my cultural surroundings, lovingly to embrace the sense of uncertainty deep within myself. This deep uncertainty was the source of my fiery enthusiasm and creativity as well as my susceptibility to error, which I had come, like my peers, profoundly to disregard and mistrust, as well as over-extend myself in trying to compensate for. Now, in this painting, positive and negative were seen not as being in opposition, but rather as complementary push and pull potentials drawn together by a dynamically balancing, intermediary self-centre that included both. Negativity, seen here as the inductive presence of spatial possibility and consequent uncertainty, was no problem. Rather it was *negation*, the *denial* of negativity - the 'double negative' of 'false positivism', whose strictures and structures refuse to admit the possibility of error, that could lead to catastrophic imbalance and the dislocation of content from context, of self from other.

### ***The Complex Self: Three Vital Aspects of Space in Place***

A year after painting 'Loving Error' and immediately prior to the collapse that marked my departure from mycological research, I painted another picture with a botanical theme. This picture, shown in Figure 9, was based on the moss, *Tortula muralis*, whose little rounded, bristle-covered, spear-thrusting cushions growing

on the surface of brick walls had always induced an intense empathic regard in me since I first came to recognise them when I was in my teens. There is something profoundly soothing about these little cushions that softens even the hardest of edges and makes my heart leap for joy. At the same time there is something strident and persistent about them that suffers no nonsense and keeps going even in the most exposed and vulnerable of situations.



**Figure 9. 'Tortuous Advance'** (Oil painting on canvas, by Alan Rayner, 1999). *The moss, Tortula muralis, with twist-topped spore-producing capsules and cushions of bristle-pointed leaves, bravely advances across an exposed boundary of constraining brickwork built both to shelter and to confine human beings, towards a distant green hill. The hill contains the self-same shape as the*



*moss and is topped by a trinity of trees, two straight-trunked, the other forked, symbolizing the union of shadow and conscious selves.*

I feel this painting symbolizes my own long haul towards accepting and acknowledging aspects of myself that I had felt obliged by the expectations of others - which became my own introjected expectations - to attempt to deny or exclude. By including and connecting the reciprocal negative needful emptiness and positive resourcefulness of my inside and outside, and vice versa, I began to feel free, without contradiction, to love 'other' as my outer self together with 'me' as my inner self. I could give precedence to the living space of my dynamic neighbourhood, of which I am a uniquely situated local expression, deserving love and respect. On a good day at least.

I started to see my own and other 'bodies' as the outwardly visible linings of flow-forms rising, subsiding and reforming in oceanic space. These bodies are no objects. Rather, they are soulfully inhabited *places*, distinct but not discrete energetic *expressions*, ever-transforming through the dynamic, reciprocally breathing relationship of inner with outer through intermediary. Their material linings have no independent meaning or existence in themselves and are sloughed during the return from inner to outer space that we know as ageing and death. It is what these linings contain and relate with that makes them special, filling them during life with the vitality and beauty of living space, which makes all the difference to our feelings and well being. This living space may correspond with what Jack Whitehead describes as 'Life-affirming energy', oriental thinkers regard as 'Chi' or 'Qi' and modern cosmologists allude to as 'dark energy' (when outwardly situated) or 'dark matter' (where inwardly situated).

So I feel that to focus, as we humans are prone to do, on the explicit material linings of our bodies alone, as the basis for our attachments, detachments and judgements of worth, is grievously to miss their deeper significance and beauty.

These linings are holey embodiments of inductive space - sacred places filled with yearnings that when denied may turn to hatred. The most beautiful supermodel body in the world can only be a statuesque subject for admiration, not love, if the empty, needy spaces of its humanity are obscured from view. Faultless, covered up and made up, this body is loveless, the ultimate victim of the desire for closure, desperate for the attention of the masses but lacking the attraction to hold them close. Such is the tyranny of fashion in the Vogue, anti-cultural, newness-obsessed wastelands of modernity, to have made such superficial models of our selves that we often lose touch with the implicit beauty that remains and emerges mysteriously as our lining crumbles.

Aware through this combination of my superficial seeing of the material linings of bodies with my deeper feelings for their embodied spaces, I can now appreciate my place, along with others, as an expression of *everywhere*, like a local whirlpool in a non-local water flow. I do not feel alone – I belong *with*, but decidedly not *to* every other, *together*, coherent through the connectivity of our common space, unique in my individually situated identity.

In this way, I suggest that we can each perceive our natural being as a *complex self*, a neighbourhood togetherness of inner with outer reciprocally coupled through *intermediary* spatial domains rather than a dislocated, *self-centred individual* imposing upon and imposed on by others. This perception may actually enable us to transcend the I/You, Here/There, Us/Them divides that engender so much human conflict and environmental damage. Instead of ‘arguing the toss’ in an adversarial debate between alternatives, we can understand life and evolution *like a coin rolling on edge*, coupling distinct but not discrete possibilities together through the *space-including thickness* of its intermediary interface, rather than collapsing into the stasis of one possibility or the other. By the same token, no sooner do you or I deny, through the detached way of seeing implicit in orthodox imposition, this thickness that holds us together like thieves in the night, than we collapse the flow-form of our complex, space-including, space-included selves.

And we find ourselves back in opposition, focused on material, out of touch with immaterial.

### ***Death and the Loving Darkness of Fire Light***

A further year after painting 'Tortuous Advance', I experienced one of the most powerful dreams that I can remember. The dream is set in the house in Water Street that I lived in during my PhD studies in Cambridge. I am with a gathering of family, friends and acquaintances, past and present. There is the commotion of a tremendous lightning storm outside of enormous and unearthly power. There are multiple flashes of lightning every second, and with each flash the flames of candles in the room soar upwards. I go to the window and see rain-pelted, lightning-bolted city streets with people milling about in confusion. Orchestrating the scene is an awesome, giant figure. The figure resembles Anthony Gormley's 'Angel of the North' sculpture, but lacks wings and has arms gesturing like a conductor to the milling crowd. The figure is outlined in brilliant, fiery light, but transparently dark in its interior. I join the crowd and the dark angelic figure beckons to me to join him.

Here again, it seems, is the expression of the Shadow Archetype, harking back to the fire-lit darkness at the heart of my painting, 'Loving Error' and my own inner sense of deep uncertainty that I may desire to fix, if only I could. But this time there is a vital clue to the real life identity of this figure in the soaring candle flames that herald his appearance. An identity whose negative charge has had the most extraordinary influence on the evolution of life on Earth, combining, like the Hindu Goddess, Kali, dreadful destructive power with the giving of life-affirming energy.

The real-life identity of the dark angel is, I suspect, a natural product of life - or, more specifically, plant life. It also radically transformed the condition for life on

Earth as an ever-changing dynamic context. Indeed, when I first recognized this identity for what it is, helped by my research companion, Zac Watkins, it radically transformed my understanding of all those fascinating aspects of the way terrestrial life forms, especially fungi, grow and interact with one another.

Through its special quality of supporting combustion, this dark angel identity both empowers inner life through inspiration - in-breathing, and returns inner life to the re-creative possibilities of outer space through expiration - out-breathing and death. It is none other than the vital space of oxygen - life's first, most dangerous and exciting addiction.

Although most of us have been brought up to take for granted that oxygen is life-supporting, biological scientists have become increasingly aware over the last 20-30 years that it also has a 'dark side', engendering ageing and death. The reason for this is the affinity of the space within the place that we call an oxygen atom for those flow-forms of negative charge that we have called electrons. In supporting combustion, oxygen accepts electrons one at a time in the course of being reduced to water, as occurs in the 'controlled explosion' that we know as respiration. Respiration reverses the process of photosynthesis, by which green plants harvest the electromagnetic energy of sunlight to generate oxygen and complex organic compounds from water and carbon dioxide. Where photosynthesis builds organic complexity and generates oxygen, respiration degrades organic complexity into carbon dioxide and generates chemical energy and water. The majority of organic life on Earth thrives in the balancing of these two great interdependent processes, one destructive, the other constructive, each containing the seeds of the other like the inductive dark and assertive light of the yin and yang of Taoism.

The dark side of oxygen is related to the fact that the controlled explosion of respiration depends on the maintenance of a dynamic balance between the supply of fuel, in the form of organic compounds, and the demand of oxygen for the electrons derived from this fuel. Only if there is such a balance is oxygen

reduced 'safely' to water. Otherwise, the respiratory process becomes overloaded and generates highly excited forms of oxygen and chemical 'free radicals' capable of destroying the coherence of living cell substance. Death is then the inevitable consequence as the explosion runs out of control.

This near-death 'oxidative crisis' is faced by all life forms in circumstances where their fuel supplies become diminished and the continuing expansion of their boundaries (i.e. growth) becomes unsustainable. Moreover, it is especially acute for those forms that inhabit land/air, where oxygen diffuses ten thousand times faster than for underwater forms.

As is the way of life on Earth, it responds to this crisis of its own making with the most extraordinary evolutionary creativity and re-creativity, involving fundamental transformations and shifts in activity. The juvenile ways of active growth and energy-gathering through soft, flexible, permeable boundaries are superseded as sex organs develop. Skin, in one form or another, begins to toughen and thicken, impeding both water loss from insides to outsides and oxygen admission from outsides to insides. We become, quite literally, horny and leathery. With wonderful economy, oxygen is itself involved in these changes. Its presence internally induces shifts in metabolism that lead to production of 'anti-oxidant' compounds that not only quench its 'free radical' potential, but may also play secondary roles as hormones, nerve impulse amplifiers or suppressers (known collectively as 'neurotransmitters'), vitamins and antibiotics. Meanwhile its interaction and incorporation with compounds on external surfaces leads to the production of protective, relatively impermeable, insulating layers and coatings. The latter include lacquers, corky, horny, leathery and woody materials, derived by the chemical cross-linking of aromatic compounds, proteins, fats and oils.

Here we see how life conditions the spatial possibility for its own evolution through the resonant relationship between inner and outer. In a process of mutual attunement, change in one simultaneously reciprocates the other, as in a



pair of dancing partners. All evolution involves co-evolution of inner content with the larger context of which it is a local expression. By producing oxygen from water via the energy of sunlight, plants created the contextual condition that enabled them eventually to emerge from water onto land and produce a diversity of form culminating in the trees that monkeys and apes can climb and swing through.

### ***Balancing Positive and Negative: the Electromagnetic Lining of Space***

The dark angel's affinity with oxygen's destructive and creative capacity highlights our very ambiguous human relationship with what we have called 'negativity'. Somehow we are always inclined to regard negativity negatively - as something undesirable that takes away from positive and therefore entails loss from what otherwise might have been. This negation of negativity has produced the desire to eliminate or exclude negativity in the profound act of denial and suppression that I alluded to earlier as 'false positivism'. A positivism that distinguishes greater from lesser and always regards the former as better than the latter, regardless of context.

But, what, really do we mean by positive and negative and is it truly better to be one and not to be the other? That is the question that reveals our double standards when we isolate space from our consideration and focus only on its material lining as suitable for our quantification. For then it really is only the material that we take into account, whilst disregarding how this material relates with the space that it inseparably lines and includes. It is in this one-sided accounting only for the material that our habitual notion, enshrined in conventional theories of economic growth, emerges of progress as a process of positive acquisition along a straight path stretching inexorably towards infinity. Negativity is then seen as a kind of 'anti-material' influence that takes away from the positive and hence slows and, if large enough, may even reverse progress

along this path. Negativity in this light appears as *less than nothing* - less than zero - which cancels positive. What on Earth could that mean, I remember wondering during my Primary School lessons, because it seems to make no sense at all - *something less than nothing*? Years later, it still makes no sense, if used only in material terms.

The problem here lies in that as soon as we only take account of material quantities in our summing up of the world and universe, we run headlong into the paradoxical brick wall of the 'singularity' or 'completeness', which I mentioned in an earlier chapter. We find ourselves accounting for 'One Alone' as a discrete unit, with nothing to relate it to, caught up in the problem of self-reference revealed by the Cretan Liar paradox. Because we can't think beyond the box that we have constrained our logic within, we reduce the world to a set of independent building block units that we put together and take apart as if nothing else mattered. We get zero - nothing - as an absence of material presence when we subtract one of these units from another, but then how we get either of these independent units in the first place is a deep mystery. We find ourselves flipping back and forth between having something *or* nothing whilst lacking any connection between the two.

The problem resolves as soon as it is appreciated that Nature is, at root, a coherent togetherness, rather than a singularity from which negativity subtracts material content. The tangible and intangible aspects of Nature are *inseparably coupled*, with each both shaped and being shaped by the other in a universal dynamic relation of figure with ground, lining with space. This inclusional appreciation implies a very different meaning for 'positive' and 'negative', so that rather than being treated in effect as material and anti-material, they become regarded in terms of counterbalancing potentials on either side of zero. This zero is hence not a material absence, but rather a place of dynamic balance - a pivot, hinge or fulcrum where receptive and responsive influences are both combined and differentiated, as in my earlier folded sheet of paper analogy.

It may help to envisage the implications of this coupled relationship by thinking of a pair of weighing scales. To each pan is added a weight of exactly 1 gram. The pans remain level with one another. So in one sense we have a combined positive weight of 2 grams. But in another sense the presence of the weight on the left hand side of the scales counteracts the presence of the weight on the right hand side so that their net effect on the position of the balance beam is zero. So, we could legitimately write  $1 + 1 = +1 -1 = 0$ , depending on how we view the situation. In this case, positive and negative are purely relational concepts relating to complementary pushes and pulls - or, alternatively, pressures and vacuums - on either side of a dynamic fulcrum.

The pivotal role of boundaries as dynamic, co-created, co-creative intermediary places reciprocally coupling the inner and outer callings of complex selves was effectively recognised almost two millennia ago in the T'ai Hsüan Ching of Yang Hsiung. As with 'inclusionality', the T'ai Hsüan set out to acknowledge a vital presence ('Jen') coincident with and communicatively balancing between emergent dual polarities (Ti and T'ien). These polarities were akin to the reciprocally coupled Yin and Yang of the I Ching, but the latter was extended into an explicitly *ternary* logic through the introduction of a dynamically balancing, intermediary agency.

With these thoughts in mind, if we re-examine Figure 8, we can see that at its heart is an intermediary, relational identity that includes and dynamically balances an inflow aspect with an outflow aspect. Hence it connects in a circulatory way with everywhere within, through and around itself as a dynamic boundary or guide lining: dark with light, dry with wet, cold with hot, frozen with melted, living with dying.

This intermediary, complex self-identity is therefore no numerical 'singularity' or 'one aloneness' of the kind produced as an artefact of the abstraction of space

from matter and associated imposition of discrete limits. It does correspond, however, with the 'zeroids' that lie at the heart of the wonderfully creative, literally mind-stretching 'transfigural mathematical' systems of 'fluid logic numbers' and 'zero spirals' devised by my Nigerian friend, Lere Shakunle.

Before I attempt to introduce 'Shakunlean Mathematics', I want to return to the heart of the matter that lies in the foundations of orthodox mathematical symbolism and leads to deep paradox when it comes to applying this symbolism to the 'real' world.

### ***Comprehending Infinity as the Limitless Presence of Space***

On September 15<sup>th</sup>, 2000, I made a desperate journey of around 130 miles, through stormy weather and in the midst of a fuel-shortage crisis, with a warning light flickering on my car's dashboard. I stopped to pick up my sister, Joy, from her home in Woking, Surrey, and continued to the nursing home near Bognor Regis, W. Sussex, where my mother lay dying. When my sister and I entered the room, we found my mother speechless, wild-eyed and greyish yellow. She had lost the swallowing reflex and her breathing was laboured and noisy. She kept tugging at the sheets like a child desperate for a security blanket. Every now and then, a nurse would come in to suck out the gooey saliva that was accumulating in her mouth and try to make her more comfortable.

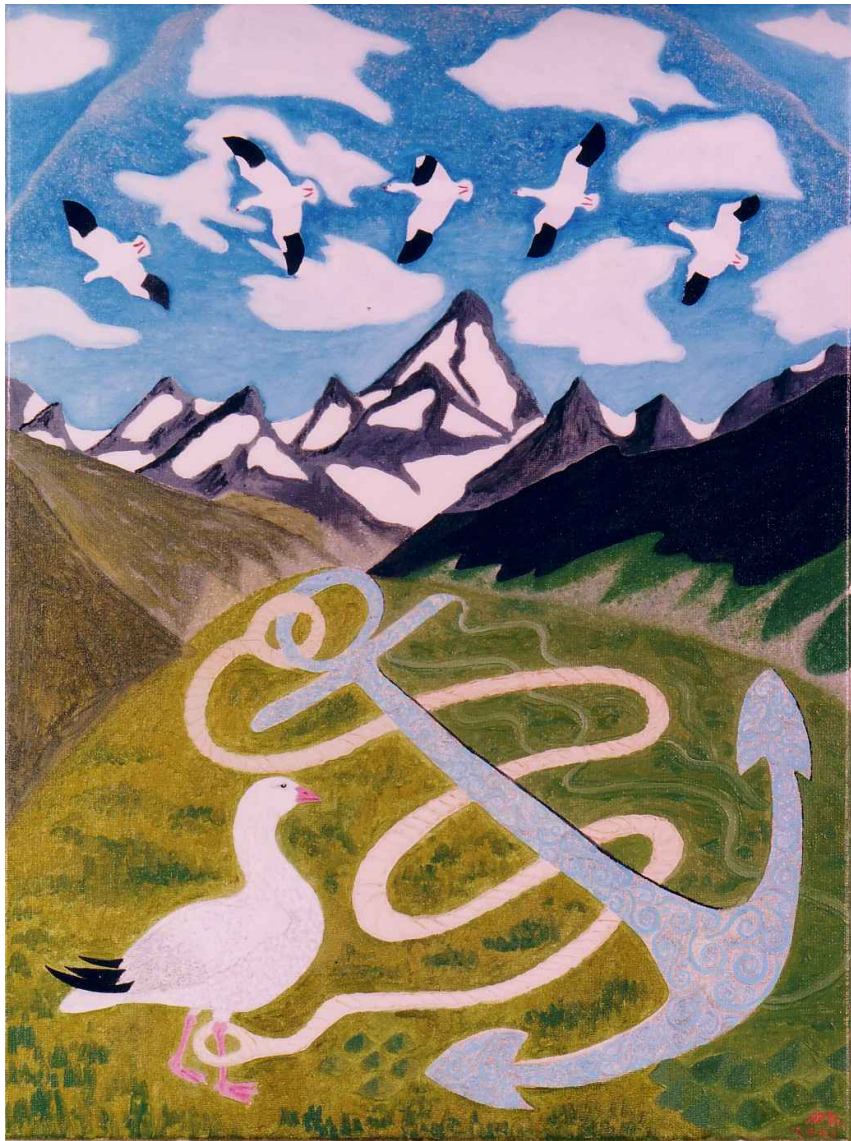
I didn't know what to do or say. What could I do or say? Perhaps I could only be lovingly present with her as she expired.

I described a dream to her that I had experienced a few weeks previously in which I was on a plane that landed at Anchorage in Alaska. It was a brilliantly clear day, so I looked out of the Airport window to see if I could see Mt McKinley, the highest mountain in North America. Sure enough, I could see a range of

mountains and in the far distance was one that was clearly higher than all the others. That must be *it*, I thought. But then, as I continued to stare into the distance, I realized that what I had taken to be clouds above the mountains were actually snow patches on an enormous, summitless, barely visible peak that lay behind and beyond all the others.

As I reached the climax of this description, my mother let out a long, loud sigh. I don't know whether this was just a reflex, or whether perhaps my description had registered with her, but somehow it seemed to let loose of all the pent up anxieties of her long and far from painless life. My sister simply said, 'go and find that mountain, Mum!'

Some months later, I painted the picture shown in Figure 10.



**Figure 10. ‘View from Anchorage’** (Oil painting on canvas by Alan Rayner, 2001). *The clear perspective of explicit landscape features grounded within a fixed reference frame, is dwarfed by the implicit view taken in from encircling flights of Snow Goose imagination, where cloud-dappled sky becomes summitless, snow-patched mountainside, far beyond the peaks and troughs, light and shadow, of rational consciousness.*

This dream and painting seems to me now to relate very strongly to that most mysterious of mathematical concepts, that of ‘infinity’, which had to be developed in order to quantify curved structures using abstract linear methods of analysis (the ‘irrational’ number,  $\pi$ , is a product of such imposition). But it also implies that to look for understanding of this concept in limitless material terms makes nonsense. No matter how high we try to pile the material quantities that we define as discrete numerical units - isolated bodies - we will always fall far short in our comprehension of fathomless depths and summitless peaks. Like it or not, to comprehend infinity, we have to take a fearful leap of imagination, and in making this leap, we have to shift our focus from material to immaterial presence. This is the leap that conventional mathematical abstraction of content out of context fails to make, leading it to make a meal out of the simultaneous distinction and common identity of One and Many.

Shakunlean, Transfigural Mathematics, as I have slowly come to understand it for myself, is based on making sense of One and Many simultaneously as *both* the same *and* different, without contradiction, rather than giving rise to the nonsensical paradox that comes from one-sided abstraction. It has the following *ternary* or inclusional features, which distinguish it radically from orthodox mathematics:

1. Implicit space, as a vital presence of material absence is  
inextricably included within, around and through the explicit linings

that give dynamic form (i.e. flow-form) to distinct features or 'configurations' of all kinds.

2. This space is where 'infinity', far from being an expression of limitless material presence (content), is located as a realm of indefinite inductive potential or '*receptivity*' applied via its linings, which fold inwardly and outwardly over all scales of magnitude.
3. Spaces on either side of a lining attract in opposite/complementary directions, which can be represented as positive and negative (omega and alpha) depending on their relative situation.
4. These complementary attractions are mediated and dynamically balanced through the space of the lining itself, which hence lies at the heart of inner-outer relationship and cannot be reduced to a finite Euclidean point-centre.
5. All numerical features formed through this dynamic balancing process have both local (finite) and non-local (infinite) aspects combined via their intermediary linings.
6. Zero is the condition where complementary attractions are exactly balanced, rather than an absence of material presence (content).
7. All 'contents' are locally lined expressions of non-local spatial 'context' and cannot be separated therefrom.

This purely mathematical description correspondingly relates to the implicit physical presence of gravitational space informed/stiffened explicitly with electromagnetic linings to produce the dynamic flow-form features of nature. It also corresponds with the light-lined space of the giant, beckoning figure in my 'dark angel' dream. In terms of numbers, it replaces the idea of these as singular 'units', with that of 'threesome-onesome couples' of inner with outer through intermediary domains - the latter being the locations of the 'zeroids' or 'self-identities'. Correspondingly, the conventional number, 2, is identified transfigurally in terms of its nearest neighbours (which it respectfully emerges

from and is in the process of becoming) as '1,2,3'. Similarly, the conventional number, 3, is identified as '2,3,4' (which includes 2).

In this way, all numbers are included together in fluid relationship, as aspects of one another, distinct, but all of the same fundamental form, unlike binary systems, where 0, 1 and infinity are fundamentally different and inaccessible to or from one another. The symbol of the cross, (+) is seen as the loving inclusion of receptivity (-) with informational lining (I), so that (+) and (-) no longer cancel one another out, but are like solute and solvent combined in solution. I is transfigured through love (-).

The geometry that emerges from and underlies this numerical representation is full of inwardly and outwardly flowing spirals. 'Male' receptive responsiveness combines with 'female' responsive receptivity in forming an inner zeroid. This coupling has the form of Lennon and McCartney's phrasing: all you need is love, love, love is all you need. Perhaps this is the mathematics of love, the mathematics of the included middle that liberates us from the loveless contradiction of the excluded middle and false positivism.

### ***Community Well-Being - Co-Creative Culture***

The philosophical shift from rationalistic unitary or binary to inclusional quaternary logic is in many ways both small and subtle. It involves a simple inversion from content-first assertion to context-first reception, and thereby from fixed boundaries and centres that make *entities discrete* to dynamic boundaries and centres through which *identities* become *distinct*. The ramifications from this shift are, however, extraordinarily deep and wide-ranging. To paraphrase Neil Armstrong, 'a small step for a man may be a giant leap for humankind' – if only we can feel the difference it makes and not be afraid of it!



Here, as a counter-current to my description of the spread of dis-ease in an earlier chapter, I will try to describe how I think this small step can transform the diverse symptoms of Anti-culture into something more healthy.

***Internal Empowerment.*** By accepting that as complex selves we both dynamically include and are included in space, we regain access to the non-local power source from which Anti-culture would dislocate us, which enables us to move ourselves, both emotionally and physically, in dynamically transforming relationship with other(s). We contain inductive, dynamic 'centres of attraction', focused through the shifting boundaries of our living space, rather than imposing or imposed 'centres of attention', objects to be pushed or push around. We are at liberty to be authentic, enjoying the knowledge of our belonging where we are, caring and cared for. Holy Spirit is within us and amongst us. Life is an inspiration, death an expiration, the one constructively configuring, the other destructively remobilizing spatial possibility, each reciprocating the other in a vital, co-creative dance of 'information' (putting space into form) and 'exformation' (taking space out of form).

***Sharing Responsibility, Valuing Identity.*** Knowledge of our common spiritedness reminds us that our influence can only ever be partial – we cannot exercise absolute control over our own or others' destiny, we can only contribute. We need neither be bullies nor victims. Due to the complex interdependence of content and context, no one can be singled out as solely responsible for any triumph or disaster, but each can make a unique contribution. Responsibility is therefore to be shared – not something to shirk or assume an unfair share of. Uniqueness of identity and view is something to be cherished and incorporated into collective decision-making, not squeezed out by the rule of authority or majority. All can and should have their say, especially those closest to the creative boundaries where possibilities open up and close down.

**Quiet Conversations.** Far from needing to be eliminated as undesirable noise, outside interference is the very basis of inclusional modes of communication that enable 'source' and 'receiver' literally to correspond with one another, to engage reciprocally in a truly co-creative, mutually transforming dialogue. Here, common space provides connection, rather than separating distance, and boundaries are places of co-creative mediation – dynamic intermediaries – rather than places of delimitation between inner and outer domains. These dynamic intermediaries are hence the seat of informational correspondence between inner and outer phases like the banks that couple a river's stream and catchment. Such inclusional information does not therefore come pre-packaged, only to be reproduced in the receiver as more of the same, but as an ever-changeable re-creation of diverse identities. By bringing these diverse identities into correspondence, a representation of reality can emerge that encompasses the rich complexity of relationship between relief and space in all the unique aspects of natural flow-form features.

**Encouraging Diversity: Educational Guidelining.** The holographic bringing together of diverse perspectives, each uniquely partial and hence both inadequate in itself but simultaneously a vital and special contribution to the overall picture, necessitates a radical change in styles of governance and education. Here, the emphasis shifts from intimidation and the imposition of standards to encouraging the development and expression of diverse individual (distinct but not discrete) identities. Learning becomes a process of recreative self-discovery facilitated by educators whose role is to provide guidance and an awareness of knowledge rather than to instil more of the same. Error is readily accommodated collectively, through complementation of individual differences, and can open up new possibilities for exploration. A sense of belonging and self-worth comes not from being like everyone else but from realizing the uniqueness and limitation of individual perspectives. Governance emerges from the expression and complex dynamic relationship of many viewpoints brought into focus rather than the hegemonic imposition of one.

***Forgiving and Encouraging Trespasses.*** A sense of belonging, of caring for and being cared for by others, of being valued – loved – unconditionally for ‘who you are’ rather than conditionally for ‘what you do or don’t do’, naturally obviates any inclinations towards antisocial behaviour. There is an immediate sense that by harming other, you harm yourself and that by valuing yourself, you value other. Equally, there is an immediate understanding of the context-dependence of all behaviour and the associated capacity of Anti-culture to exacerbate feelings of fear, anger and alienation. Moreover there is recognition of the vital role of deconstructive and erratic processes in freeing up possibilities for movement and of the difficulty in discriminating between ‘good’ and ‘bad’ in terms of long-term outcome. Hence it may be recognized that infringement of rules laid down by Anti-culture is not only inevitable, but also not necessarily a ‘bad’ thing, and that obedience is not necessarily ‘good’. Many of us feel a sneaking admiration for the upstart in others and ourselves and a distaste for the obedient ‘goody-goody’, which comes from an inclusional appreciation of the vitality of disruption in a dynamic, recreative existence. This appreciation is our protection from the self-righteousness that claims ownership of territory – moral ‘high ground’ – independently from the needs and contributions of others. This appreciation also provides the basis not only for forgiving, but also for *valuing* and maybe even *encouraging*, one another’s trespasses.

***Natural Economy.*** Only human beings have found it necessary to invent money. All other life forms simply attune their patterns of behaviour to their immediate circumstances, giving and taking in response to needs and opportunity, entrusting their destiny to the flow of which they are dynamic embodiments.

For there is a natural current of responsive supply and receptive demand, which flows counter to the currency of Anti-cultural financial management. This current wastes nothing, because its inner space phase is reciprocally coupled with its outer space phase through its dynamic intermediary phase. It differentiates

expansively where there is plenty and integrates where there is shortage. It creates the space into which it flows. It is non-hierarchical. It is not possessive, always ultimately yielding up whatever it takes in, and so does not need complex management structures to keep ahead of the competition. But what life, what diversity it generates along the way!

By easing out of Anti-cultural financial management it may be possible to ease ourselves back into this natural current, allowing it to take us where it will, trusting to its capacity to balance things out, intervening to stay afloat or change direction as and when we need to. In this way we can live a richly rewarding emotional and spiritual life of diverse relationships. We don't have continually to stop and account for everything to ensure that we gain and keep as much as possible for ourselves and aren't hard done by. We can care and be cared for as and when need and opportunity arises, sure in the knowledge that by helping others we help ourselves.

***Beneficial Surrenders.*** The letting go of ownership, the willingness to surrender to one another, rather than the will to win against other, removes the need for costly defence and attack strategies to preserve and expand self-identity in a state of adversarial Anti-culture. In the absence of assault, there is no need to win and hence no need for assault. The vicious circle is nullified.

***Respecting Living Space.*** When outside is understood to breathe into inside, and *vice versa*, through dynamic connections, it becomes impossible to ignore, and hence abuse living space. We care for one another through caring for the common space we dynamically embody.

Promoting Health. By caring for and attuning diversely with living space, we promote health and sustainability rather than seek to eradicate the disease and instability engendered by processes of eradication.

***Creative Involvement.*** A sense of belonging, valuing and being valued for who we are, brings a sense of creative involvement and removes the need for employment at all costs.

***Loving Fear.*** Fear is not an enemy. It is a vital means of avoiding harm. But treated as an enemy, it can become an enemy, growing out of proportion and potentially bringing about the very harm that it seeks to avoid. To love our enemy is to love and transform our fear, making our common uncertainty and vulnerability the very basis for a richly creative, richly relational life of dynamic balance between our inner and outer selves, reciprocally responding to one another.

Dancing gyroscopically.

#### **4. Keep on Rolling: Dynamic Indeterminacy**

### ***To Coin an Evolutionary Phrase: Contextual Transformation***

With the coin and river as metaphors for the dynamic balancing of complex selves as flow-forms, a new understanding of evolutionary processes comes into view. To my mind this understanding is very different from the notion of natural selection. The potential nihilistic havoc of the linear snake confined angrily within the walls of its pressure-cooker container is transformed into an exploration of curved inner, outer and intermediary space with endless possibilities.

Hence we move on from explaining evolution as a progression of extinctions and survivals – annihilations of those individual contents judged externally to be ‘not good enough’ and their resultant replacement by their ‘betters’ – to appreciating it as a process of continual contextual transformation. Instead of seeing ‘ends’ as determinate places of absolute closure, we can envisage all ‘endings’ of local flow-forms, as they surrender their vital energy-space, simultaneously to be indeterminate openings that release potential for new creative expressions, as I alluded to in my painting shown in Figure 5. The apparent loss of ‘one’ is simultaneously the source for emergence of ‘another’ in an open-ended process mediated through open-ended flow-forms that whilst individually distinct never completely lose their inclusional spatial connection. The vital energy-space of ‘one’ thereby becomes embodied in rather than annihilated by the ‘other’, and emerging forms creatively re-express and so honour rather than vanquish, the submerging ancestral forms from which they emerge. Past and future are inseparably coupled through rather than dislocated by the dynamic, permeable bodily boundary of the ever present.

Correspondingly, I feel that to impose closure on this indeterminate, open-ended process - as orthodoxy has been doing for so long, both in theories and in management practices aimed at control, is ultimately to commit a kind of ‘mass suicide’. To avoid this fate, we need to recognise the games of closure that we continually play in trying to stave off the uncertainty of the void that we fear so

terribly. Not only that, but we need to find ways to hold possibilities open, both for ourselves and for our offspring, to *keep on rolling*, as I allude to in the painting shown in Figure 11.



**Figure 11. 'Holding Openness'** (Oil painting on canvas by Alan Rayner, 2005). *Light as a dynamic inclusion of darkness continually brings an endless diversity of flow-form to Life.*



If we want to know how to embody this *holding openness* in our own lives, I suggest that we need to look no further than a vital ingredient of natural evolutionary processes that our compulsion to impose closure has led us to set aside and treat only as a curiosity.

## **Forever Young – ‘Neoteny’, Sex and The Nurturing Of Natural Recreation**

In the first chapter I described some of my formative experiences of joy and pain as a child trying to make sense of the world, whilst subject to the powerful external influence of my parents and teachers. I told of the incongruity I felt between my perceptions of the world as a child, and the way I was increasingly being instructed to think and act by my elders. I had a sense that my child’s eye view of the world was not acceptable to those powerful elders. So, it seemed that I needed to adopt their views as quickly as possible if I was to have any chance to survive, let alone thrive, in the world that they patrolled as fearful guardians.

Under my elders’ influence, my vital, living spirit seemed like an innate wildness, which, if let loose, would wreak havoc in my own life and everyone else’s. It needed to be brought under control, disciplined and informed by the knowledge and practice of my forefathers. This process of disciplined information gathering dominated my learning experience. It seemed forever before I could at last fly the nest and launch myself into the world of productive work. I wondered what was the point of being a child and having to go through this exhausting, exhaustive process. I thought about mortality as a terrible waste of all the investment made in the accumulation of knowledge and experience whilst growing up. I began to fear death almost as much as a waste of every body’s and especially my own time on Earth as from any deeper existential angst. How could Nature be so perversely wasteful, making childhood a necessary evil – a means to an end –

that we all somehow had to get through before we could have any prowess in the world, only then to die?

In September 1976 our first daughter, Hazel was born, making me a father. I was allowed to be present at the birth, even though it was a forceps delivery, because I had displayed my scientifically objective sang-froid by making a chart of my wife, Marion's, duration and periodicity of contractions in the preceding few hours. This chart persuaded the doctors, if not Marion herself, that this was no 'false labour', but the 'real thing', and that birth was imminent. But my chart-making masked an inner emotional turbulence and anxiety that grew to dizzying proportions as Hazel was pulled brutally to 'safety' when her placenta relinquished its role, her heart started to slow, and she emerged bluish, bloody and creamy before gasping, crying and turning pink. On the small side and a couple of weeks premature.

From that moment, I experienced what up to then I could only imagine – the extraordinary combination of loving and fearful emotions that comes with the responsibility of bringing a new, oh so small, oh so seemingly fragile life into the world. My previous perceptions of childhood and adulthood began to invert. Now I had to experience, from the other side, the process of helping to nurture a child through to adulthood. I had to watch by as the outside world put this child through endless harsh examinations and subjected her to criticism and fear before she was finally accepted into the career of her choice – as a child and adolescent psychologist! And I wondered what was the point of subjecting her to all this exhausting, exhaustive process. As I have done again, with my younger daughter, Philippa as she has endeavoured to develop and apply her love and ecological understanding of flowers to enrich wasted landscapes. As I do, again and again as a University Teacher, watching generations of students come and go through the 'system', in danger of having their love extinguished and replaced with cynicism.

Do we really have to bully our children so much? What is it we are so scared they might become if we don't impose closure on their wild creative energies? What might we and they be missing as we groom them prescriptively for adult roles in our socially constructed world of fixed boundaries? What is the point of having children if we wish them merely to be reproductions of those of us who have come before, carrying all the baggage of our past acquisitions, force-fed with pre-packaged knowledge and ready to regurgitate? If that's all we have children for, then maybe we really are wasting both our energy-space and theirs, and failing to learn one of the most obvious lessons that there is to be drawn from the natural world.

I think that some vital aspect of life goes missing when our quest to outwit our mortality and so not lose what we have invested so much store by, leads us vainly to try to make children into reproductions of ourselves - especially if human cloning becomes common practice. We lose the rejuvenating scope for responding co-creatively to and with our ever-changing living space. We set a course for ourselves that is Hell-bent on stasis - a self-perpetuation that can only end in premature degeneration, as with the arthritis suffered by poor young Dolly, the first 'successfully' cloned sheep.

The obvious, but strangely overlooked point is that unlike 'clones', children, as the offspring of sexual coupling made between male and female under the shadow of oxidative death, cannot be regarded biologically as 'reproductions' – more of the same! Rather they are wonderfully diverse recreations, emerging from the varied recombination of DNA from their parents within the watery context contained by their bodily boundaries, which relate dynamically to the circumstances of their living space. The abiding characteristic of these diverse recreations is that they play as they explore and experience the ever-changing shape of their spatial context. In this child's play, the possibilities for serendipitous evolutionary discovery and creativity are endless.

The evolutionary importance of the capacity to explore playful possibilities is evident in a phenomenon long recognised, but perhaps little understood by biologists, which is known as 'neoteny'. This phenomenon, the retention of juvenile characteristics by adult forms, is believed by many to have brought about some of the most dramatic innovations in the evolution of life on Earth. For example, the monocotyledons - predominantly narrow-leafed flowering plants like lilies, grasses and palms are thought to have evolved in this way from broad-leafed ancestors (dicotyledons). The entire line of back-boned creatures or vertebrates, including human beings, is thought to have evolved from the larval stages of sea squirts. We human beings are thought to be neotenuous apes. We live through many years of childhood, growing very slowly before attaining adulthood and even then retain a playful curiosity and imagination, if we allow ourselves to, which lies at the heart of our inventiveness. Many of our domestic animals are thought to have endeared themselves to us through their child-like characteristics of affection and malleability. We owe so much it seems, to the playing field of our evolutionary childhood. Yet we continually try to suffocate it at birth. Why?

The fact that we human beings tend to dismiss our childhood experience as little more than a flight of fancy, a costly preparation for adulthood, when our serious life's work begins, may be the product of the psychological and bodily changes that accompany adolescence. Ironically, these changes are often represented as the *onset* of conscious awareness. Actually, I think they represent the *rationalization* and consequent *imposition of closure* upon our wider consciousness of void space, through which we make our universe and its contents seem more definite, describable and predictable than they really are. Although these changes may be essential to our adult ability to be 'better informed' and so care for, protect and educate one another, their influence can become abusive if we use it to impose closure upon our intuitive powers and the variable reality of dynamic Nature. They do not, in themselves, bring the kind of

wisdom that the Greek philosopher, Heraclitus, described as ‘the *understanding* of how all is steered through all’.

These psychological changes both reinforce and are reinforced by the cognitive illusion to which we all become increasingly susceptible during adolescence. As we approach adulthood, especially in traditionally male roles, we seek to see *more clearly* as a means of finding, catching and grasping food, making our way through the world, and avoiding and protecting ourselves and our loved ones from danger. We therefore tend to become more and more dependent on our *eyesight* to inform ourselves about the world around us. By the same token, the role of our other senses diminishes, along with our emotional responses, as our skins thicken and harden and our nervous systems become inured and habituated to the uncertainties of our outside world.

In this way, as we strive for independence we literally lose touch with reality whilst claiming to have a greater grip on it. This is because our binocular vision, whilst giving us the seeming clarity and depth of field by which we can sort one ‘thing’ out from another, also narrows our focus to whatever lies in front of our noses. We lose sight of spatial context and begin to see the world as an assembly of hard-lined, independent, solid objects surrounded and isolated by emptiness. It is as though we acquire a subtle knife, which we use to cut ‘figures’ free from their contextual ‘background’, so that they appear to move independently *through*, rather than reciprocally *with* space. Even when we perceive interconnectedness, we tend to envisage this explicitly as a ‘web’ of hidden ‘threads of meaning’ rather than as communicative channels of included space.

Only if we somehow manage to retain or reclaim and value our juvenile sensitivity to our outsides, so that our *seeing includes our feeling*, can we gain the kind of open-minded wisdom that Heraclitus spoke of. We may do this in a variety of ways, all of which tend to mark us out from others in modern society as

‘unusual’ or, more disparagingly, as ‘abnormal’ or even ‘insane’. We may retain strong spatial connections between our left and right brain hemispheres, a feature reportedly characteristic of women and dyslexics. We may maintain a low availability of the neurotransmitter, serotonin, in our brains, a feature said to be characteristic of ‘sufferers’ from ‘obsessive-compulsive disorder’ (like me - as well as some more famous people, thought to include Charles Darwin, Howard Hughes, Winston Churchill, John Bunyan, Saint Therese, Samuel Johnson..., for which reason it might more aptly be called ‘openly creative disorder’!). We may deliberately reduce availability of serotonin by taking hallucinogenic drugs, meditating or trepanning (drilling holes in our skulls) as with Gurus and shamans. We may gain a sense of inner-outer reciprocity through experiencing the buoyancy of bodies immersed in fluid space. We may gain an all round view by gathering together around a common space in circles like those of aboriginal and pagan cultures, and sharing our unique local perceptions, so that a holographic image of our situation emerges collectively.

But, meanwhile, the orthodox preclusion of such perspectives by the compulsive closure that divides the world absolutely between something or nothing (matter *or* space) has constructed an enormous edifice of mathematical, scientific, philosophical and governmental space-excluding and thereby love-excluding logic. We impose this logic upon the child-like creativity issuing from the wild uncertainties of the void that we try so hard to avoid. As I allude to in the following poem, and the painting shown in Figure 11, we tend to become grave as we approach the Grave. We impose our seriousness upon the delights and joyful laughter that find connection with our vital, playful spirit through openings to a world beyond fixed limits.

## RECREATIONS OF A PLAYFUL UNIVERSE

Oh, how we laugh!

When Some Thing  
Touches Our Spirit  
Tickles Our Imagination  
Recalling Our Place  
In a Playful Space

A common enjoyment  
Of a Common Enjoinment  
Recreations  
Of an Ever Present  
Folding

Dynamic Boundaries  
Pivotal Places  
Incomplete Surfaces  
That make distinct  
But Never Discrete

Unique and Special Identities  
Possibilities Realized  
That Can Never Be Bettered  
And can never be Severed  
From a Context Within and Beyond  
That Makes Us Content  
Belonging Together  
Adoring Our Differences  
Inseparable in Our Incompleteness

Our Self-Insufficiency  
That Unites Us in Love  
A Receptive Space

A No Thing Place  
That Keeps Us Coherent  
Within and Without  
Enveloped and Enveloping

No Need For Rules  
No Need For Rulers  
With Space in Our Hearts  
To Include Other as Us  
A Diverse Assembly  
A Joyous Relief  
Reciprocating Each Other's Movements  
Dancing in High Spirits

Oh, how we cry!  
When Made To Deny  
Our Communion With Other  
No Mother, No Brother  
No Sister  
To Assist  
Our Passage  
Through Pain

But a Father Severe  
A Tyrant Authority  
To Cut Us Off  
Within Fixed Boundaries  
In Isolation

Pretending Independence



Making Comparisons  
Striving To Remove  
What's Not Good Enough  
In Pursuit of Perfection, Control, Prediction

A rationalistic Ideal  
A Uniform Whole  
A Self-Sufficiency  
Tolerating No Hole  
No Breathing Space  
No Place for Grace

Demanding Reproduction  
More of the Same  
A Perpetual Cloning  
With No Room to Err  
No Room to Wander or Wonder

A Solid Object  
With Space Outcast  
An Infinite Outsider  
Offering No Possibility  
Of Excitement or Joy

A Purified Presence  
A Divine Right  
Freed From Wrong  
An Unreal Abstraction  
Motionless  
Emotionless  
Random Disunity

Divine DisContent

A Need For Rules

A Need For Rulers

No Space in Our Hearts

To Include Other as Us

A Monoculture

A Dull, Flat Field

Where Conflict Abounds

So, For Heaven's Sake, Father!

Take a Look at Your Wife!

Isn't She Sexy?

Get a Life!

Be Your Self!

Give Us Guidelines, By All Means

But, Please

Don't Hold Us Against Them

Stop Repeating Yourself!

Put Away Your Severing Knife!

Or, at the very least

Make a Hole that Heals

And Recreates -

Lets Us Play!



**Figure 12.** **'Recreations'** (Oil painting on canvas, by Alan Rayner, 2004). *A playfully spinning wheel of black and white human figures relates in turn with erupting volcano riven with red gold lava streams, floodlit enchanted wood and lily pond cascading into pale reflective sea.*

**Breaking Symmetry – Travelling by Tube and Helter-Skelter**

So, an important way of holding openness and keeping on rolling for us human beings is, indeed, through having children and retaining and enjoying rather than closing down their playful possibilities. Along with that we can keep our minds alive to possibility throughout our lives, in a way that as neotenuous apes we appear supremely gifted in being able to do as long as we allow ourselves to. In keeping our minds alive to possibility we can simultaneously transform our behaviour to attune with our ever-changing circumstances.

But there is one way in which we are limited, and this limitation can itself impede our holding openness, oddly enough by leading us to perceive that we either possess, or should possess, the individual 'freedom' that we call 'independence'. Like many other animals, which can't rely on their sources of nutrition and other resources simply to fall into their mouths like manna from Heaven, we are obliged to move bodily around a heterogeneous world in order to find and take in what we need to keep our lives rolling. Consequently, rather than being able to spread themselves out by continuing to grow indefinitely, our bodies have become confined into local, seemingly self-contained individual forms that spend much of their lives rushing around by means of various kinds of locomotion.

Our development is therefore fundamentally determinate - encapsulated within bodies with limited life spans that cycle between egg and adult phases, from which death appears as a place for exit rather than entrance. No wonder we're so inclined to take a particulate view of the world when our own bodies appear to have such a discrete and transient form. But perhaps if we were, or could imagine ourselves to be, plants or fungi, for example, we might develop a very different kind of view of the limitations and possibilities of our bodily existence. I suppose that may partly be why I myself have tended to take such a different view from what many might consider the 'norm'. In having spent so much of my life studying plants and fungi, and trying to understand them, I have tried to imagine how the world might look from their perspective.

Unlike animals, which move bodily from place to place by means of locomotion, many plants and fungi spread themselves from place to place by means of growth. This is related to the fact that they absorb rather than ingest the sources of energy they need. Such absorption is maximized by producing as much intermediary surface area as possible between inner and outer spatial domains.

Relative to that of many animals, the development of many plants and fungi is therefore much more outwardly expressive than inwardly contained and so can be regarded as 'indeterminate' or 'dynamically bounded'. The possibility for further expansion persists throughout life and need have no specific limit within the confines of 'adulthood'. Correspondingly, in Utah a 'single' aspen plant, covering an area of 43 hectares has been discovered, made up of around 47,000 tree trunks and estimated to weigh almost 6,000 tonnes. And there are some even larger (in terms of acreage) single fungal identities known to exist, thousands of years old and still spreading.

As I mentioned earlier, these indeterminate plant and fungal body forms develop in a rather wonderful way, whereby death, as an opening, can literally be seen to nurture the recreative possibilities of new life within their own body boundaries. They characteristically form elongated, tubular structures, variously known as hyphae, roots, shoots etc, which grow at their tips. These tips have a parabolic shape and can be thought of as places where the organisms remain 'forever young', forming boundaries that are deformable and responsive to changing contextual conditions as they explore the ever presence of their living space. Behind these tips a cylindrical structure is formed whose boundary may become rigidified and made impermeable to different degrees, depending on circumstances. In trees, for example, a relatively impermeable layer of bark, containing the corky material known as suberin is formed. This insulates the interior from external stresses and prevents drying out, whilst still containing local openings called lenticels that enable the structure to breathe. Continued

production of tubular woody tissue and bark then bring about 'secondary thickening' of the structure and a consequent increase in its diameter.

The ever-young growing tips of plant and fungal body forms are sustained by resources gathered in by and redistributed from other places, which literally 'pass on' and ultimately die. Plant leaves, for example, pass on the sugars that they produce through photosynthesis, and eventually lose their greenness and change to red, yellow or brown as they 'senesce' and drop to the ground, where the residual nutrients they contain are remobilized by decomposition. The centres of fungal mycelia (collective gatherings of branched hyphal tubes) die off as their resources are passed on to the actively growing margins of those annular formations sometimes called 'fairy rings'. Death in the interior of plants actually produces the woody tissues through which water and mineral nutrients are distributed from roots to shoots. These tissues then ultimately become dysfunctional – when air gets into the pipelines, so disrupting their water supply, and then become decayed, leading to the 'hollowing out' that we often see in mature trees. Mulch often forms at the base of these hollows, and it is not uncommon for the trees then to re-root into this, in effect feeding directly from their own re-cycling remains. Everywhere in non-human nature, new life is fed by the passing on of old life. There is no 'waste'.

But how do these tip-growing, elongated, tubular structures arise in the first place? In addressing this question we can begin to see how back-to-front orthodox linear analysis and explanation are in relation to the reality of natural dynamic form and formations. Natural, electromagnetically lined (stiffened) space is primarily curved and hence non-linear. Linearity, where it occurs, is a natural product and not a primary ingredient of non-linear form. To render, as in differential calculus, natural curved space form down into discrete linear 'building blocks' that are then assembled into shape is a kind of 'reverse engineering', which puts the cart before the horse. It cannot in any way faithfully represent, as opposed to artificially simulate natural evolutionary process. When we try to

model nature in terms of such abstraction, any conclusions we draw will inevitably be topsy-turvy and liable to misrepresent reality profoundly.

Throughout my life I have retained a child-like delight in watching the behaviour of raindrops on a windowpane or car windscreen. In some mysterious way I find this both fascinating and deeply comforting. What I love watching most of all is the way a little rounded, surface-tense droplet - a bit like the cushions of the moss, *Tortula muralis*, shown in Figure 9 - gathers itself together as smaller droplets coalesce with it. Then, suddenly - Bang! - Off it goes as a little rivulet with a parabolic tip races across the glass.

I get the same kind of feeling, drawn out over a longer period, watching fungal spores and plant seeds germinate. A phase of swelling in all directions, associated with uptake of resources from outside and softening of the lining seed wall or cell wall, is superseded by the emergence of a germ tube, which brings the inner world out of itself into sensitive exploration of the outer world. The dormancy of an encapsulated 'survival package' almost cut off from its outside in a condition of suspended animation is broken as its boundaries are mobilized and life is re-awakened and regenerated with renewed vigour. Wow! But something even more fundamental than the near-stasis of dormancy is broken during this dramatic transition.

The most condensed form of energy-space, dynamically balanced between reciprocal inner and outer attractions, is that of a sphere. As any soap bubble will inform you, this is the form in which the area of intermediary boundary surface exposed to the outside - and its associated 'tensions' - is minimal. It is also the form that can be sliced into two equal and opposite halves by an infinite number of planes of radial symmetry. Correspondingly, its surface has 'centres' everywhere because there is no location on this surface that can be regarded as any more central than any other. As this surface expands equally in all directions (i.e. 'isotropically') its curvature decreases along with the proportion between its

area exposed to the outside and the volume that it encloses, hence increasing the strain on its coherence. Moreover, an infinite 'number' of further centres are added to the infinity it previously contained, making nonsense of the idea of infinity as a singularity of unlimited discrete material contents, which I mentioned earlier. Sooner or later the gathering tensions become too much and are released by being redistributed into smaller, but more numerous, or elongated forms. The area of exposed surface in relation to volume contained by these forms is greater than that of their progenitor sphere, whose infinite radial symmetry has thereby been broken or reduced to a smaller number.

In biological systems, the breaking of spherical symmetry to produce a tube occurs, as I have alluded to earlier, in seed and spore germination, whereas the breaking up of this symmetry into smaller globular forms is a feature of early embryonic development and spore-formation. These processes of extension and 'multiplication by division' have the effect of increasing the intermediary boundary surface through which resources can be both gained and lost between inner and outer spatial domains. This 'boundary maximization', or 'self-differentiation', as I have called it (see earlier), is characteristic of patterns of growth or reproduction where external resources are plentiful. Where supplies are short, boundary-minimizing processes of 'self-integration' set in, which restore symmetry within various kinds of survival and storage structures. This restoration of symmetry is reminiscent of processes of condensation and solidification involved in phase changes between gas, liquid and solid forms, which occur as temperature decreases (see also a later section, concerning life as an embodied water flow).

As I mentioned earlier, both in biological nature and nature generally, the primary geometric form is that of curved energy-space. All other geometric forms, including those that we call 'linear' - consisting of smooth, straight lines and flat surfaces - are derivations from primarily spherical form, not vice versa - as our analytical logic and methodologies would have it. For example the compression together of even-sized, flexibly bounded, spheres produces a hexagonal array,



as found in honeycombs and crystal lattices. The deformation of spherical form resulting from energy-input from outside to inside can produce ellipsoidal and spiral as well as tubular forms. Indeed the latter forms often do spiral as they elongate, resulting from asymmetries in their deformability on either side of their central axis. These spirals not only occur in familiar examples such as snail shells, but also in plant stems and fungal hyphae, which have been found to rotate as they elongate. Indeed plant stems characteristically produce leaves in a spiral pattern corresponding with the 'Fibonacci series', which converges on the 'irrational' number known as the 'golden section' or 'divine proportion'. The latter is the proportion between the larger and smaller sections of a length that is the same as the proportion of the larger section to the overall length - the hallmark of 'classical beauty' much used by artists.

Nonetheless, the cylindrical outward shape of plant stems and fungal hyphae can often be remarkably straight-sided, and their rate of elongation under constant conditions, once it has reached a 'threshold', is also often 'linear', adding identical lengths over equal time intervals. This has led many to suppose that linear growth is primary rather than a derivative from non-linear growth, and to incorporate this supposition into geometrically unworkable mathematical models - as I once spent much effort trying to demonstrate towards the end of my mycological research days.

### **From Out of the Sustaining Yolk to Under the Imperial Yoke - and the Liberation Possible in Going Beyond One Sided Rules and Rulers**

A fascinating example of how we human beings derive linear from non-linear geometry, only then to impose the linear upon the non-linear in the mistaken belief that we are thereby increasing 'efficiency', can be found in our design of buildings and travel and communication systems. The way in which such imposition is also associated with very cruel and powerful but ultimately

unsustainable hegemonic forces is demonstrated par excellence by the Rise and Fall of the Roman Empire.

There is a dramatic difference in the nature of archaeological remains in England during the first few centuries AD, compared with before and after this period. Prior to this period, the geometry of human dwellings and sacred places was primarily circular, consisting of Neolithic, Bronze Age and Iron Age round houses, hill-forts and henges. Moreover, the communication paths and enclosures between and around them were circuitous, tending to follow the contours of natural landscape features - as they often do even in modern times. This is celebrated in the saying 'the rolling English drunkard made the rolling English road'. But during the first few centuries AD, buildings, roads and enclosures became uncompromisingly straight-sided as they were imposed upon rather than yielded to the natural landscape.

This imposition of the rectilinear and straight and narrow occurred when England (the Scottish proved a little too wild to tame in this way!) came under the Yoke of Roman Occupation. Similar, but more recent examples of the imposition of such 'gridlock' upon natural landscape and aboriginal peoples can be found in North America and Australia. Such imposition is characteristic of all kinds of orthodox analytical methodologies, Cartesian mappings and architectural plans. Nature is required to conform with prescriptive rules and rulings, regardless of the contextual discomfort of those confined within or outcast beyond them.

The persistent notion that this imposition represents the epitome of disciplined efficiency and hence is to be desired and admired, has proved enormously costly both to human beings and to the living space that we share with non-human nature. It is founded on the unrealistic premise that the geometry of nature either is, or should be, primarily linear - an 'ideal' homogeneous Euclidean 'flatland' or 'solidland'. In adhering to this premise, we don't even notice the very real wastage we bring about by trying to eliminate waste, because we exclude it from

our one-sided systems of accounting in discrete freeze-frames of space and time. We are proverbially 'penny wise and pound foolish', except that the real costs are far greater than our monetary abstractions could ever portray. The real costs are to our humanity and the quality of our own and others' lives. We might seek, according to the modern clarion call, 'to Make Poverty History', but we can never find how to accomplish this aim so long as we hide behind our abstractions.

In our imaginary inhabitation of 'flatland', we automatically assume that the shortest distance between two points - and hence the most efficient way of travelling from one to the other - is a straight line. When we impose this assumption on an undulating landscape, as in Roman road building, we neglect the influence of gravitational space in our accounting - as is apparent to any motorist travelling regularly along such a highway, from their increased fuel consumption and gearbox and engine wear.

By the same token, we assume that the most efficient way of packaging material, by avoiding 'waste' residues 'outside', is within rectilinear frameworks. So we habitually make building block constructions for ourselves to live in and fend off our neighbours whilst gouging out landscape to make way for road, rail and canal links. Historically at least, we have given little thought to the damage we engender in making these constructions. Nor do we consider the discomfort we ourselves feel as we try to circulate within the hard lines and musty corners of our homes and workplaces. Try to swirl water around a square glass if you want to get a feel for the incongruities from which this discomfort arises. We continue to pay for the apparent economies we make in the short term, long after the builder has left the scene, counting explicit financial gains whilst ignoring the ongoing costs for those living with the implications.

So, what hope can there be for us to escape from the yoke we have placed on ourselves? For such liberation to be possible I feel that our only recourse is to re-

educate ourselves to grow beyond our desire for the false security of closure. We need to return the wiser from our excursion into flatland and learn from our immersed experience as complex selves, attuning with, rather than imposing upon, the non-linear nurturing presence of our living space.

### **Holding Openness in Education – A Personal Experience of Lifelong Learning Put Into Practice**

Upon returning from my own excursion into the Academic Wilderness in 1999, I wanted to bring a very different dimension to my role as an educator at the University of Bath. I wished to relinquish any semblance of being a dictatorial authority transmitting my expert knowledge and understanding to students in the hope that they would reproduce it in their examinations and careers. I wanted students to be lively recreations, hopefully influenced by my guide-lining spirit, not reproductive clones dully and dutifully following my prescriptions for their success. As I will describe again in a later chapter, I wanted to be an Arthurian gatherer-together of diverse perspectives, not an Authoritarian dictator of the status quo. In short, I wanted to transform the dynamic geometry of the educational process, rather than training exercise, in which both I as learning teacher and the students as teaching learners are engaged, so as to sustain an ever-present neotenous possibility for transformation.

And so I set about designing a new course, coded BB30108, about which I felt passionately inexpert, a real amateur – literally meaning ‘lover in public’ – in the midst of the professional practice enshrined by my Institution. I became intent on becoming a professional amateur, prepared to play with my disciplinary boundaries whilst still having a source of financial income to keep me going. But being a professional amateur in this way, as I was soon to find out, was no easy ride! In the following passages I will describe my own learning process,

navigating the complexities of relating both to students accustomed to being recipients of authoritarian teaching and external assessors accustomed to transmitting 'received wisdom'. I hope that this description may convey something of what 'holding openness' really means in an educational context, by way of remaining alive to possibility as we learn, teach and encounter resistances together during our unique individual experiences as dynamic inclusions of our living space.

After much thought about how to summarize its full scope and depth in a few, reasonably familiar words, I called my new course 'Life, Environment and People'. In tune with the ternary theme of inclusionality, this three-in-one coupling connected 'inner', 'outer' and 'intermediary' as well as 'Complexity, Uncertainty and Information'.

When I first presented course BB30108 in 2001, I stated my 'intention' to the biology and natural science students attending it as being:

'To improve your and my awareness of the dynamic properties that underlie the functioning and ecological and evolutionary responsiveness of living systems, with a view to developing patterns of relating to these systems that enhance quality of life both for them and us'.

Four years later, I modified this statement as follows:

'To provide an opportunity for us to reflect and learn together about how to apply our scientific and biological knowledge effectively and creatively in a social and environmental context. This joint reflection and learning will include an enquiry into methods of scientific enquiry, perception and communication in order to identify possible limitations in current thinking and prospects for the development of approaches that can enhance and deepen our understanding of human relationships with the living world'

I believe that this shift in the way I expressed my intention demonstrates my own practice as a 'learning teacher', open to the influence of those whose learning I was trying to engage with. It reflects my gradual transformation from a remote, 'Authoritarian' to a co-responsive, 'Arthurian', style of educational leadership, which, as it turns out, actually enhances rather than diminishes the value of my unique knowledge and experience.

This shift also reflected my efforts to clarify the educational context of the course for those who had no actual experience of it but nonetheless felt in a position to judge its content from outside, in their own terms and without any consultation with me. Somehow I had to quell the disquiet - and resultant misunderstanding, misrepresentation and threats of closure - of those given executive authority by the University, whose orthodox expertise we appeared to contravene, whilst holding true to my educational values. I sought to do this by co-enquiring with the students about the application of this scientific and biological knowledge in the social and environmental context that 'pure' scientists often ignore and even treat as beneath their dignity. Moreover, I made perceptions of space and boundaries the explicit ground for our co-enquiry, for which my own life experiences and learning had prepared me only too well. In this way I hoped to place both the students and myself to explore in a non-adversarial way the uncertainty and exquisite form of actual nature and human experience. Maybe our explorations could thereby help reveal the contextual space that is so vital to our understanding of life and its evolution, but is so dismally overlooked by orthodoxy.

It wasn't long before I received my first lesson from the students during our opening session in February 2001. I described my intention and handed out detailed accompanying notes drawing on themes from my book, 'Degrees of Freedom'. I informed them that after nine double sessions led by me, there would be three 'Round-Table' sessions about environment-related themes of their

choice, these they would organize entirely themselves. I said that in order for me to assess their work and allocate marks, as I am obliged by the University to do, there would be a coursework component in which artwork would be welcome, as well as a formal exam. I explained the links I saw between art and science, and then provided a preliminary background to inclusionality and its departure from conventional 'Newtonian' thinking.

Within a week, the numbers of students attending the course had more than halved! Seeing 'trouble ahead', I wondered at my audacity and foolishness in attempting anything so far removed from conventional biology teaching. What on Earth was I doing? Why on Earth was I doing it? What might I be exposing myself to?

I asked one of the students what she thought was going on. Apart from the students' natural fear of uncertainty and confusion in the face of assessment, she quickly drew my attention to what Jack Whitehead would call the 'living contradiction' between my intention and my practice. 'Why don't you include us in your discussion?' she asked. 'After all, you've given us copious notes, which we can read in our own time, so why not use the sessions to get us talking?'

Feeling rather chastened, I swallowed my dignity and took her advice. I laid my notes to one side and started to ask questions both of myself and of the students. Often these questions would superficially appear to be quite simple, e.g. 'what is a gene; what is a cell; what is a body; what is death?' But the answers to these questions were by no means simple, and often led to further and deeper questions. For example, I especially remember during one of the discussions about genes, a student asked, 'what's the difference between a code and a language?' This question quickly established the importance of context in giving varied meanings. On another occasion a student insisted that we could not escape our own 'selfishness' in order to live in a more 'environmentally sustainable' way, however much we might pay lip service to the need to do so.

This led to my recognition of the need to question our conventional view of 'self' as independent 'individual', and ultimately to the development of the idea of 'complex self'.

Almost immediately, the atmosphere within the class began to transform and attendance stabilized to a total of seventeen – not a huge number, but viable. It was demanding work for me to maintain a lively, but coherent and scholarly conversation, whilst not imposing a fixed direction or stifling the students' views with my own – and it still is. But the sense of pleasure coming from the students as they were able to express and hear diverse views and play with ideas was ample reward. This sense of pleasure was confirmed by the 'feedback' I received from them, by the quality of their coursework and the 'Round Table' sessions that they organized without intervention from me. One of the pieces of artwork submitted was of such quality and depth that I felt moved to award it 100 % of the marks available. To my huge surprise, even the external examiners were highly complimentary.

Greatly encouraged, I repeated the course in 2002 to more than double the number of students, using much the same approach. I took even more care to try to relate with rather than transmit to the students despite the impositional geometry of the lecture rooms. For example, I would sometimes move myself to the back of the class of desks laid out in rows facing the front. Once again, after some initial bemusement, the student response was highly creative and favourable. The 'Round-Table' sessions were of a higher quality than many conference workshops I have attended. I remember one especially where the students moved furniture around to contrast the very different atmosphere of confrontational 'debate' from 'sharing circle' styles of discussion about 'genetic modification'. Also, this time a much greater proportion of superb artwork was submitted as coursework - so much that I decided to mount an exhibition in the Biology Department. Several colleagues, both from within and outside Biology 'sat in' on the course and were very impressed with the depth and quality of the



discussions. A Psychology PhD student also sat in to study the student responses and shifts in understanding. I learned from this study that the course was having a powerful educational influence, but I needed to be wary of esoteric language and appearing to 'preach to the converted'.

I felt confident that my academic peers would again welcome what the students and I had been doing. I trusted that they would continue to see it as a very innovative development, taking Biology education into new avenues of exploration and exposition, highly relevant to the students' future careers and responsibilities.

How wrong I was! The first thing I noticed was a kind of 'deathly hush' and some grudging comment during the Biology examiners' meeting about the high marks I had awarded the students. This comment was accompanied by questions about how far the department wanted to go with this approach. But nobody actually said anything directly to me until months later, when it emerged that there had been complaints about 'lack of rigour', an 'anti-scientific' stance and 'free-fall philosophy' evident in students' work that I had rated highly. I was called to see my Head of Department shortly before resuming teaching the course in 2003 and warned to be rigorous in my assessment of the student's work, whilst being reassured of his support for my 'academic freedom'.

I went on to teach the course in 2003 in a rather more wary frame of mind. Again the students responded favourably after initial bemusement and again they produced remarkably creative work. Against my wishes, however, my coursework marks were 'scaled down' before the examiners' meeting, so as not to be out of line with those given in other courses. The examiners' meeting passed by with quite favourable comment and only a hint of reservation, so I felt that I had at least averted the criticisms made in 2002, but a while later, I again found myself confronted with adverse comments. I was asked to ensure that when I taught the course again in 2004, I would give 'poor marks' to work of 'insufficient

scholarship', i.e. making assertions unsupported by evidence or showing a lack of awareness of other points of view. I had no problem with this because it aligns with my educational practice, although I disliked the emphasis on penalty rather than reward. I was also asked, however, to agree to the exam papers being 'triple blind marked' in order to reassure examiners about assessment standards. I had no option if the course was to continue, so I reluctantly agreed, even though independent marking by examiners with unequal experience is contrary to my educational values and principles.

In 2004, I had an even larger class. There were around seventy students including two studying psychology, which enriched the discussions. Once again the students responded very favourably and creatively and producing even more high quality artwork. Once again I set up an exhibition of their work in the Biology Department. Many, both from within the University and outside came to visit and expressed wonder at the creative expression and insights of science students ready to question received wisdom and see possibilities beyond. But amidst the excitement, I received a message from my Head of Department saying that colleagues had expressed disquiet about the 'anti-scientific' and 'dogmatic' content of some of the work. I was warned to 'watch my back' and to give this work 'poor marks'. A while later, after the students had sat the exam component of the course, I received a call from one of the blind markers asking me what I meant by one of the questions. It transpired that these markers had been appointed without consulting or informing me, and in the case of at least one of them (and retrospectively both of them), were not people I could expect to appreciate the learning context of the course.

I began to panic, fearing greatly for the prospects of the students and the future of the course. As it turned out, I had good reason to be anxious. It emerged that, based on their own interpretation of the exam questions, the other markers had repeatedly allocated marks that were drastically lower than mine. I was obliged to argue that only my marks should stand, since only I had any appreciation of what

the students' answers might and might not be expected to include. Ultimately this was accepted in order, ironically, to keep the marks in line with those of other courses.

Then one of the other markers, who up until then I had regarded as a generous minded colleague who appreciated my work and intentions - he had even encouraged me to design the course - wrote a report on the lines of 'Is There a Problem With BB30108?' This report was based purely on his own interpretation of the student work, and profoundly and damagingly misrepresented my scientific position and educational approach. For example, I was said to have criticised the dependence of thermodynamics on 'closed systems', when I had made no direct mention of thermodynamics in the course. I was also said to have disregarded the importance of genes in the way life forms interact, something I would never do (though I do criticise genetic determinism). He suggested that I had made students think inappropriately even if I hadn't intended to. He said that I had inordinately worried the students by seriously undermining all that they had been taught about science and that I should give a 'health warning' about the content of the course, warning the students that few people shared my views. He made recommendations about how the course should be modified if it was to run in future, which, although well-intended, were inappropriate to its aspirations and unreflective of my own biological knowledge and understanding. I replied, pointing out the many ways in which I felt he had misrepresented the course and myself. He replied, re-stating his belief that I had misguided and confused the students in ways that had disturbed their appreciation of mainstream science. He said that although my colleagues were still well disposed towards me, they couldn't understand why I had taken such a controversial stance.

Ten days after the Board of Examiners, I received a summons from the Head of Department asking me to attend a meeting with him to discuss the 'future of the course'. When this meeting eventually took place, after I had taken a much-needed summer break, he drew my attention to very critical comments made by

the external examiners on the grounds of 'scholarship', notably regarding the fact that the students had expressed views that closely reflected my own. He asked me to withdraw the course for the coming academic year, to modify it into a more acceptable form, and to run it again in a subsequent year, probably with a different title. I said that I would prefer to continue to run the course, and pointed out how some of the external examiners' remarks about individual student scripts - which included such phrases as 'scientifically worthless' - actually demonstrated their own lack of understanding of the concepts addressed. I said that to discontinue the course on the basis of ill-informed, easily refutable comments made by external observers unaware of the actual course content and mode of delivery would be a great disservice to the students who found it educationally very valuable. I showed him copies of the very favourable student feedback forms from the current year class.

### ***Objections to Inclusionalty - A Case of Autoimmune Disease and its Possible Treatment***

So, could anything *good* come out of all this? As I reflected on my experience, it was the fear evident to me in the reactions of my usually generous-minded colleague that especially concerned me. There was something in these reactions all too reminiscent of those directed against other critics of neo-Darwinism in particular, for example, the late Stephen Jay Gould and against heterodox reformers in general. These reactions characteristically seem to have two aims. The first is to belittle criticisms of established thought or models, by making them appear as minor variations that can be added on to the same fundamental proposition. For example, special 'epicycles' were used to account for the complex path of the planets in the Ptolemaic Earth-centred representation of the universe and 'drift' is used to account for 'selectively neutral' genetic change in neo-Darwinian evolutionary theory. In this way the mainstream idea can still be sustained within a kind of 'pluralism' that 'open-mindedly' accepts some

peripheral amendments, as long as they don't become too powerful. It is very tempting, as a budding reformer, to accept this belittlement or to allow it to continue in the minds of the powerful in order to survive and at least divert the mainstream a little from its hegemonic course. This is because if the first aim isn't achieved, the second aim is the elimination of what is perceived as opposition to the mainstream because it is so fundamental that if it were given any credibility at all, it could not possibly be ignored or marginalized.

Since the core belief of orthodox evolutionary thinking is in the extinction and replacement of objective units by force, there is embedded in this thinking what might be considered an 'autoimmune disease', which cannot admit any other possibility for fear of itself being extinguished. It cannot accept what it has defined itself not to be through a 'double blind double bind' based on the fallacy of the excluded middle. Hence it will automatically reject the inclusion of 'other' as an aspect of 'self', even though the need for such inclusion may be recognised. Pluralism safely and inconsequentially skirts around the inclusion of self within void, like froth at the mouth of the vortex. By contrast, inclusionality implies letting go of the concrete and immersing in the void as a dynamic embodiment of space. Letting go is made possible through recognizing both the fallacy of definitive orthodoxy and the opportunities for new understanding that open up when space is given room for inclusion in a non-Euclidean dynamic accounting for natural flow-form.

So in my efforts to convey an inclusional understanding of the dynamic nature of neighbourhood, I need to make the abyss seem less scary and more inviting. This is why I emphasize that inclusionality represents a paradigmatic *transformation*, where the old is incorporated, though radically re-interpreted and made vastly more applicable in a real-world context, within the new, as distinct from a paradigm *shift* where the old is made extinct by the new. This transformation is nevertheless very difficult to accomplish in the face of anyone

who believes fundamentally in objective definition and so suffers from autoimmune rejection of the outer aspect of self as other.

Clearly, up until 2004, my efforts in my 'Life, Environment and People' course had inspired the students but alarmed the authorities, and I was in great danger of autoimmune rejection. Nevertheless, the course continued to run in 2005, with similar numbers attending, although under threat of closure if the external examiners again expressed concern. By then I had received much support from colleagues outside my own Department, who considered the course is needed and of high educational value. This helped me to stand firm in the face of great difficulty.

In 2005, students studying Management attended for the first time and showed great interest in understanding how ideas and knowledge about biological and human organizations could be linked. This corresponded with my intention to focus on application in a social and environmental context as a way of avoiding adverse reaction from anyone intent on defending orthodox scientific thought and method. It also widened the appeal of the course.

Two new forms of course assessment replaced the exam. These gave students the fullest possible opportunity to express their learning from the course in a balanced, scholarly way without requiring hurried responses that could so easily be misunderstood by external observers unaware of context. The first new course assessment asked the following question:

*How, in your view, may the application of scientific and biological knowledge and concepts in a social and environmental context be influenced by our human perceptions of space and boundaries?*

The second new assessment asked:

*On the basis of the Round-Table Session in which you participated, consider an environment-related issue or question of your choice from as wide a variety of scientific, biological and other relevant perspectives as possible.*

I also designed new criteria for evaluating the students' work, which, I felt were much more in tune with the distinctive educational aspirations of the course.

These were as follows:

*Reflective Quality:- does the work accurately and thoughtfully reflect themes emerging during the course? Are the scientific ideas that are conveyed and/or challenged fairly represented, in a way that demonstrates sound critical judgement/ understanding/scholarship in your own learning?*

*Creativity:- does the work display imaginative thought and (where applicable) practical resourcefulness in relation to the theme/subject matter addressed?*

*Communicative Quality:- does the work communicate a clear message and/or evoke imagination and thought?*

*Quality of Execution:- is there evidence of skilful work?*

*Endeavour:- is there evidence of care and effort?*

Both internal and external examiners accepted that the course succeeded in its intention to encourage creative and critical enquiry by students and the course ran again in 2006. Even so, I have faced continuing difficulty over the fact that what I look for in terms of the above criteria does not always match well with what orthodox scientists look for when independently viewing work out of context and imposing their conventions. This difficulty has emerged because of the continuing requirement for biology students only (others are beyond the

Department's jurisdiction!) to have the work independently assessed by others who do not participate in the course. This 'double blind double bind' has been difficult to negotiate with, as I admit in the following lines:

*How Academic Orthodoxy Cannot Accept What It Needs to Accept to Make Sense*

I will accept what you say if you can convince me to do so  
For I am Fair and Open Minded  
But to convince me you will have to show that I am wrong  
When all I have to do  
To be sure  
Of my independent rightness  
Is define what I am not  
And have no need for further enquiry  
Beyond the realm of my security

So I can wilfully  
With Authority  
Suppress the disquieting silence  
Of your creativity  
And be assured of the longevity  
Of my double bog standards  
Of excellent mediocrity

I have no need for receptivity  
I can fix things for myself  
For I am certain  
Of my independence  
Until you convince me otherwise  
But then again I can be sure



That you're not me

***Facing Up to an Abstract Future: An 'Either/Or' Choice?***

As fearfully deterministic creatures, up against the walls of the self-imposed closure of our security systems, the future can seem a formidable prospect, pregnant with hope and threat. There it is, divided off from our present and past (here today, gone tomorrow) lives by invisible hard lines that cut through the axis of time abstracted from space. Faced with this prospect, and especially the seeming finality of our individual deaths, we may feel obliged to make an 'either/or' choice.

On the one hand, we may choose to 'live for the present', 'looking after number one' by taking what we can from the world and one another in order to derive whatever satisfaction we can in the limited time frame of an individual existence. But in so doing, our lives can seemingly become a wasteland, devoid of meaning, lacking connectivity - a flash in the pan. The individual aspect becomes dislocated from the collective aspect of our complex self as we relentlessly pursue our internal agendas without regard for others. We live unsustainably by sacrificing the future to the present, a pattern that we may call hedonistic, greedy or selfish, but nonetheless regard as an inevitable ingredient of human nature, for which we may suffer guilt.

On the other hand, our desire for continuity in some form or another, if not necessarily in our own bodies, can lead us unsustainably to sacrifice the present to the future. Our imagined destination takes precedence over our living journey in acts of self-denial perversely intended to improve our lot. We dedicate ourselves to a goal or end by any means, however painful and damaging that

may be for us in the interim, and use the language and presence of authority figures to talk ourselves into believing in this destiny.

The remote prospect of the future, beyond the veil of our immediate present, becomes a dictatorship, to whom or which we abandon our inner identities and needs. Serving this dictatorship requires that we know in advance what it will judge to be right and wrong. So we try to second-guess this dictatorship by making our own judgements about right and wrong, and in the process can leave aside whatever truly compassionate feelings we may have about human frailty. We may even, if we judge compassion to be right, ruthlessly reject others who we deem to lack compassion and consign them to one kind of Hell or another, within or beyond this world. For example, we may declare 'War' on terrorism and set about eliminating its perpetrators. In this duplicitous way, we prepare the ground for the ideological conflicts expressed inwardly as mental torment and outwardly as Holy War, Civil War, Genocide and all forms of retributive justice.

Seeing true compassion - unconditional love of and respect for our neighbourhood as an implicit inclusion of our complex self - disappear in the gap between our hedonistic and judgemental tendencies, has been a lifelong concern for me. Aware of how both my analytical 'head' and my unforgiving 'heart' can in their different ways overrule my own compassion, not least in the austere way I am prone to view myself, I have wanted to understand how love and respect make intellectual as well as emotional sense. Correspondingly, my work on inclusionality has been about identifying and dissolving the 'clot' that currently blocks the connection between reason and emotion so that they no longer appear contradictory but can make a common, complementary sense. I have wanted to discover how to transcend the closure that imposes an either/or choice between one form of self-denial and another. How can we live joyfully and lovingly in the present without compromising the evolutionary vitality of our neighbourhood and offspring? That is the deep question - far deeper than immediate concern about legislative or technological mechanisms can

comprehend - underlying what environmentalists call 'sustainability'. It is about how we regard future and present, and how their relationship influences our relationships with one another and our living space.

The problem I have therefore concerned myself with is that loving compassion makes no sense in rationalistic terms that impose closure by abstracting time from space, as neo-Darwinism and its contribution to the emergence of fascism, eugenics, the Holocaust and 'Selfish Gene' make abundantly clear. This abstraction has a very profound influence on the way we regard ourselves as human organisms engaged in an evolutionary process.

### **An Emerging Theme – Life on Earth as Embodied Water Flows Beyond the Capabilities of Information Processing Machines**

In March 2002, at a conference in Karlstad, Sweden, I found myself pitted against an unusually generous-spirited neo-Darwinian. We were addressing one of those deceptively simple questions that I use in my 'Life, Environment and People' course: what is an organism? My 'opponent', as he liked to regard himself – even to the degree of allying with one of the vampiric figures in my painting shown in Figure 1 – became increasingly frustrated with my refusal to contest his argument that an organism is an information-processing machine. As a great believer in adversarial debate as a means of establishing 'truth', he desperately wanted me to compete with him in his own terms, to argue that organisms 'are not information-processing machines' – and so did some of the audience. I would not argue that, but rather I see functionality – what organisms do and how they are equipped to do it – as only an aspect of their much more fundamental, space-including nature. So, without antagonism (which I see as a source of 'heat' rather than 'truth'), I simply described what I feel to be the deeper view that has emerged, during my conversations with students and others, of organisms as 'embodied water flows'.

It's one of those strange paradoxes of modern biology that we attribute evolutionary success to the quality of our DNA, but when we search for the possibility of life on other planets the first 'thing' we look for is water. To my mind, this paradox epitomizes how readily we dislocate content from context, and hence time and matter from space as we try to find 'solutions' to our problems of understanding and interacting with nature in the hope of improving our abstract future whilst disregarding the 'solvent'. We know implicitly all along that the solvent is present and vital, but our focus on the explicit leads us to disregard it.

It is this dislocation that leads us to regard organisms purely in functional terms as independent machines - clockwork automatons - of one kind or another. Indeed that's exactly how Descartes viewed all organisms, in the absence of consciousness, apart from human beings. It opens the way for profound abuse and cruelty as we judge and rank one another's performance in order to choose the best and discard the rest in our quest to improve our destiny. If we perceive ourselves, or feel ourselves to be perceived as 'good machines' we become megalomaniacs and conformists. If we perceive ourselves, or feel ourselves to be perceived as 'bad machines', we become depressed, suicidal and spiteful or look for some external saviour in the form of a God or Technology - some form of Higher or Artificial Intelligence that does not suffer from our capacity for 'error'.

As I will discuss more fully later on, I personally know only too well how it feels to oscillate between what I envisage as the 'Twin Tower' viewpoints of myself as 'good machine' and 'bad machine' when the channel connecting my reason with my emotion gets blocked. Compassion either for others or for myself doesn't get a look in. I then need some space in my machine to regain my balance, and love and respect the capacity for error in others and myself that is the source of our creativity and receptivity as indeterminate flow-forms in close correspondence. So it is that I can drown my sorrows in the water that we land-inhabiting human beings so easily lose sight of, which nonetheless accounts on average for around

70 % of the mass and 99 % of the molecules in our bodies. As I allude to in the following verse and painting shown in Figure 13.



**Figure 13. 'Landed, Stranded' (Oil painting on canvas by Alan Rayner, 2004). A reflection upon the evolutionary inversion from aquatic to terrestrial life.**

I used to be  
Within the Sea  
An identity  
Of You and Me  
Submerged  
In Commonality

Of Sounding  
Between Airy Heights  
And Bottom Depths  
Waving Correspondence  
Through Inseparable Togetherness  
Of Content with Context

But, Now,  
Dry  
Abstracted  
Space comes between Us  
A separating distance  
An unbecoming Outside  
Alienating Forms  
As Fixtures  
Stranded in Isolation  
Entities  
Non-identities  
Conflicting  
Oblivious of Our Belonging  
Together

Oxygen  
Now, moving Fast  
Not Languidly  
Tans our Hides  
Protecting Our Inner Spaces  
Against its own  
Consuming Presence  
Supporting Combustion  
Burning Us Out

But all this sealing  
Removes Our Feeling  
Setting Our Content  
At Odds with Our Context  
So that we push  
Against the Pull  
With Backs to Front  
Itching to Relieve  
Unbearable Friction

And So Now  
Just Let's Go  
And, with Loving Fear  
Dive into the Clear  
And Swim Where it's Cool  
To be In With the Pool  
Together

I see water as the solvent and bathing fluid that brings space into the Earthly lives of organisms, the receptive medium into and through which life forms gather and distribute the energy that puts them in motion via photosynthesis, chemosynthesis, digestion, respiration, transport and translocation. Water provides the continuity between generations, through and in which genetic information can flow and be exchanged and expressed in endlessly diverse forms. Water is and always has been the indeterminate dynamic pool in and through which organic forms of life thrive, diversify and respond to and influence their surroundings and neighbours - an 'artists' medium' whose properties both constrain and contribute to life's heterogeneity and versatility.

A start can be made towards understanding the dynamic role of water in life by asking what possibilities for innovation and relationship exist in just a single droplet of water - like those droplets I described earlier, swelling fit to burst upon a window pane. Inclusionally, this droplet is a pool of energy-space, a dynamic context whose surface-tense boundary is the informational interface between its inside and outside. The surface area of the droplet can be altered by assimilating or discharging energy sources across its boundary. Assimilative processes result in expansion. At low input rates, this expansion is isotropic (equal in all directions), thereby minimizing the resultant increase in surface exposed to the outside. At higher rates, 'symmetry-breaking' occurs, the droplet polarizes into a rivulet or subdivides into branches that are distinct, but not discrete. At even higher rates, the droplet may dissociate into smaller droplets and ultimately molecules. Viewed at a snapshot in time, these forms may appear to be individual units but this ignores their common space life histories. Such life histories are only apparent when viewed dynamically, whence their indeterminate capacity for expansion and change reveals discreteness to be an illusion of isolated observations.

Assimilative processes bring about 'self-differentiation'. These processes generate the exponentially increasing amounts of exposed free surface characteristic of individual and population growth. As the surface generated by self-differentiation takes shape, its possibilities for change become constrained by what has already been produced. Moreover, since this surface cannot be fully sealed, it inevitably dissipates as well as gathers sources of energy and so is only sustainable as long as supplies don't run out. If self-differentiation were to continue without the replenishment of external energy sources it could therefore only end irreversibly in a boundless, fully incoherent condition. Processes of 'self-integration' counteract the dissipative effects of self-differentiation through the coalescence, sealing in and/or redistribution of boundaries, so conserving energy within the system and enabling it to rejuvenate. In the case of water, vapour may



condense into droplets, droplets may coalesce into pools and pools freeze into a myriad of ice forms with a release of stored energy accompanying each reduction in exposed surface.

Such are the creative possibilities for differentiation and integration of form even in a droplet of pure water. Now, allow materials to be incorporated or dissolved within the droplet's contents, changing their viscosity, matric, electrical and osmotic potential, or added to the surface of the droplet to form an insulating coating or envelope. Harnessed in this way, the dynamic potential for elaboration of diverse water forms becomes even greater. These forms' *permeability*, *deformability*, and *continuity* and consequent *receptivity*, *responsiveness* and *conductivity* can thence be varied according to whether their circumstances are appropriate for gathering in, exploring for, conserving or recycling energy sources. As they gather sufficient energy to begin to flow, they will, over time, both create and follow paths of least resistance in their surroundings, as in river systems. By taking substance out from their catchment, much as a hypha of a wood decay fungus might dissolve and absorb wood substance in the course of its growth, rivers effectively create their own inductive space.

In those embodied water flows that we have come to regard as organisms, materials added to and enveloping water constrain and enable the expression of diversity over scales ranging from the boundaries of molecular to social and ecosystem domains. These materials may be organic or inorganic. They may originate outside the organism's boundaries; they may be synthesized within, by gene action, or they may be produced by interaction at boundaries between internal and external reagents. They include the carbohydrates, fats, proteins, nucleic acids and other metabolites found in living cells. They include the oxidatively cross-linked hides, bark layers, cuticles and cell walls that protect and contain the living contents of innumerable forms of plant, animal and fungal life as they move or grow to form branching trajectories through space and time. They include the calcium-enriched shells and coatings of invertebrates and

algae. They also include the earthy highways, byways, dams and buildings created by animals ranging from termites and earthworms to moles, beavers and human beings as they open up and seal off paths of least resistance in their surroundings to provide shelter and avenues of communication.

In modern times, the dominance of analytical approaches to the management of life processes has led to an increasing focus on internal genetic 'information' as the principal means by which the form and functioning ('phenotype') of organisms is determined, subject only to the moderating influence of external environmental variables. Consequently, bioengineers and biotechnologists have sought means of altering this information to suit human requirements, raising many concerns about the ethics and effects of such genetic engineering on human health and the environment.

Viewed inclusionally, in the continuous dynamic context of harnessed water, phenotype is not, however, as genetic determinism would have it, a direct genetic function of environmental variables. Rather, genes are variables whose influence, along with other factors, on boundary properties affects the pattern in which water is arrayed and re-arrayed as life rolls on receptively and responsively, beyond the capabilities of dry machines operating in fixed frames of space and time.

### **The Long and the Short Run: Time Management is not Energy Management**

When we lose sight of their deeper, contextual, flow-form nature, we render all organisms, including ourselves, clockwork automatons, driven by the abstraction of time that I think is the inevitable product of our avoidance of void space. Our lives become frantic – a mad rush to 'achieve' more and more in less and less time. In our haste to get better all the time, to become more efficient survival machines, we begin dispensing with what doesn't appear to fit with our

abstracted future projections. In attempting to cut costs, by excising or disregarding those needy aspects of ourselves that we deem too costly – requiring care and affection – we cost ourselves dear in the long run, forsaking what's vital to both our individual and collective quality of life. Our lives become arid, unsustainable wastelands as we forsake the connectivity and fluidity that enables us to attune with our ever-changing living space. That is the cost of being driven by abstraction – we end up getting nowhere fast, like the demented Red Queen of 'Alice Through the Looking Glass' and neo-Darwinian evolutionary theory.

It all has to do with how we regard what we call 'efficiency' and can confuse this with other measures of 'performance' such as efficacy and productivity. When we measure efficiency in terms of speed or productivity, what we and other organisms 'do' in a fixed *time* frame, we lose sight of the *energy* cost of increasing performance. Correspondingly, we lose our compassion both for ourselves and for our neighbourhood when we rank one another as 'clockwork machines', regardless of context. Taken to extremes, we can literally kill one another and ourselves in our pursuit of the time-savings that we envisage to be the basis of evolutionary fitness and social and commercial success. In the latter case we equate 'time' with that other great abstraction of space-excluding logic, 'money'. This is the essence of unsustainability and how humanity has been driven crazy by abstraction.

In nature, 'efficiency' is more about 'ergonomics' – conserving energy – than the 'economics' of human productivity in discrete intervals of abstract time. And conserving energy is about inner-outer attunement - correspondence of content with context. The distinction and relationship between 'time costs' and 'energy costs' is evident in the difference between a 100 m sprinter and a marathon runner. The former cuts time costs by disregarding energy costs, allowing a short high performance run, but consequently cannot sustain him or herself for the long run. The latter minimizes energy costs by attuning inner with outer context

(unless you're collapsing in sweltering heat) and so has the stamina to keep going and go further and faster in the long run, which includes space.

So 'short-term' economic management, based on cutting 'time costs' at huge energy-cost, in a high performance dash spurred on by relentless competition is grotesquely dissipative (wasteful) and unsustainable. We might 'get there fast' but can't stay there. A homogeneous community selectively constituted in the short term solely of high performance dashers through the discarding of those judged 'not good enough' is dysfunctional in the long run. Yet that is what our focus on time management in modern human organizations is Hell-bent on producing. By contrast a community where there is a place for all kinds, operating and communicating over diverse functional, spatial and temporal scales, guided by the relative (but not absolute) opening up and closing down of opportunity can keep going indefinitely. If it can keep going indefinitely, there is no absolute time frame to judge the collective or individual performance of its membership within. Such is the nature of the natural communities and ecosystems of Earth's Biosphere. Such could be the nature of sustainable human communities attuned with the natural economy of conserving energy rather than obsessed solely with saving time. They could be places for compassion, work, rest and play. Places for acknowledging one another's unique idiosyncratic contributions as complex flow-form selves with inner, outer and intermediary aspects, both in the short and in the long run that includes the space that is inseparable from time, which is inseparable from energy. Places where death feeds life rather than where we feed death with life to serve our obsession with perfecting ourselves as clockwork machines.

***Everlasting Stillness or Diffuseness: The Consequence of Preserving or Discarding the Lining of Space***

Just as abstracting time from energy-space, to serve as a relentless drumbeat against which to measure our performance can make our secular lives frantic, exhausting and turbulent, so, in order to 'rest in peace' we may take this abstraction even further. Having consciously or unconsciously isolated time, we may seek to eliminate 'it' entirely. We can then bring an end to our rolling ever onwards, in one or other kind of tranquil place that we may call 'Heaven' and distinguish from another kind of place of eternal torment, which we may call 'Hell'. There are two contrasting ways in which we may do this, which appear to me to lie at the heart of the distinctive orthodox traditions of our currently predominant world religions.

On the one hand we may seek peace, love and compassion in everlasting Light, and hence seek purity through the elimination of all trace of Darkness, which we regard as sinful. This is what might be labelled (although perhaps rather too simplistically) as the western orthodox tradition of Judeo-Christian-Islamic religions, which are in turn associated with the orthodox 'impositional logic' of absolute closure that I have been questioning throughout this chapter and book so far. It is like trying to remove the fluidizing, 'solvent' space from its electromagnetic, 'solute' electromagnetic lining, leaving only the latter on which to focus all our attention and aspirations. Hence, we get hooked on the solid precipitate of living energy-space as the place to attach our material desires and longings and sell our souls out to. We adore the regularity of inert, pure, linear form, implicit in Euclidean geometry and Platonic solids as the epitome of timeless, static perfection. Ironically some may even go so far as to describe it as 'Sacred Space', of which this form is an exclusion.

So far, avoiding the void, has been my main focus in this text due to my experience of western anti-culture. But we may also actually seek it as the place of absolute formlessness where all the sufferings arising from the desires we attach to the electromagnetic linings of our lives are absolved. This is the eastern mystic and orthodox Buddhist tradition. Rather than Adam's curse, the void

becomes a blessing, a limitless presence of absence with infinite creative potential. We can find it through silent meditation, letting go of attachments to our life-linings and floating away into a timeless drift of nothingness.

But then we may 'get lost' in the pure dissolution of a primordial soup lacking any form of distinction. We lose the identity given to us by the electromagnetic linings we have sloughed in the process of becoming a Universal One rather than one of a Heavenly Host of Many 'Above' alienated from and so eternally at war with the Darkness of their common communicative space 'Below'. Becoming pure solvent, we lose the differentiation through which we conflict, but which we also need in order to relate and interact with one another in a community of diversity.

It seems to me a sad irony that both these traditions seek love, yet find it in what they perceive as opposite locations that they each try to remove or remove themselves from. As each reciprocally disowns the other, so we overlook the wonderful, joyfully creative opportunities of living and loving together in the inclusional dynamic couple of living light and loving darkness forming the complex self solution of nature. We are left with either eternal darkness-excluding self-satisfaction or eternal formlessness as the best we can look forward to at the end of our time.

Through my conversations with those holding deeper theological knowledge than me, I discover further sad irony in that the originators of these reciprocal traditions were by no means so one-sided in their own perceptions and aspirations. The one-sidedness comes literally as an 'afterthought', through the abstraction of a time frame from energy-space and leading to the imposition either of absolute closure or absolute opening by those both assuming and given authoritative status within their social context. The same kind of 'afterthought' or 'rationalistic backfill' as my friend Ted Lumley calls it, is evident again and again during the evolution of human thought in the suppression of an original inclusional awareness by the imposition of rationalistic objectification enshrined

by definitive language. Although this imposition leads to apparent simplification and greater certainty, it actually complicates the flow-dynamic of nature through the insertion of unnatural barriers. This is evident in the eclipse of aboriginal and childhood views by more 'grown up' cultures; of Heraclitus by Parmenides, Plato and Aristotle; of Kepler by Newton and of Poincaré by Einstein. So powerful is our personal and cultural desire for some kind of absolute ending of uncertainty through the removal of one aspect or the other of energy-space and consequent fixing of abstract time that we never seem able to let our inherent inclusional awareness be. We keep having to rediscover it, only to struggle to hold on to its openness as our definitive desires, mathematics and language attempt to regain control and security.

But hope remains because as ever-flowing forms, we can both relax and stiffen, so as to hold openness lovingly and respectfully within and around our bodily and mental boundaries as we correspond with our dynamic circumstances. We can, as complex selves, both be content in the unique local identity given to us by our dynamically transforming boundaries, and be context in our spatial connection with everywhere. If only we can find ways of expressing and holding on to this awareness of our three-aspect nature in the face of our definitive desires and methodologies.

What orthodoxy disowns is not, to my mind, evil, but rather a vital inclusion of a living and loving nature. It is the act of disownment that brings us to grief.

## **Holding Openness in Evolution as a Learning Process of Co-Creative**

### **Exploration**

In the long run, then, with space included in its embodied water flow, we can see biological evolution as a correspondence course of life-long learning, a process

of contextual transformation through inner-outer harmonic attunement in the ever-changing now. It is not so much what organisms 'do' in their independent right, that makes them fit, but how they correspond with their living space that makes them fitting. When we hold openness in our learning experience, we reflect in ourselves what life and evolution are all about.



## **5. Root and Branch - Tributaries and Distributaries**

### ***Riverine Life Form - A Message in Ivy Leaves***

When I resumed painting in earnest in 1997, the first picture I produced was the one shown in Figure 14.



**Figure 14.** *'Ivy River'* (Oil painting on board by Alan Rayner, 1997). *An ivy river sweeps down from its collecting tributaries in steep-sided, lobed valley systems in high mountains, through dark forest and out across a sunlit, starkly agricultural, flood plain. Thence it delivers its watery harvest through deltas of leaves and fruits to a sea filled with the reflection of sunset. The fruits and leaves of a real ivy plant fringe the view of the distant river. The erratic pattern of veins*

*in the lobed leaves contrasts with the focused pattern in the unlobed leaves and reflects the difference between the energy-gathering and energy-distributing parts of the river.*

The painting expressed my delight in finding something unexpected in the leaves of the ivy plant, *Hedera helix*, which nonetheless made enormous sense to me. Not for the first time an observation made at no financial cost and without any kind of technological assistance, in a literally 'common or garden' plant, which anyone could discover for themselves, revealed something that spoke deeply to me about the patterns produced by the embodied water flow(s) of life.

Ivy provides an especially noticeable example of a condition known as 'heterophylly', literally meaning 'varied leafiness'. This is found in many plants, whereby diverse leaf forms are produced in distinctive circumstances or phases of development. It is also a manifestation of a plant's ability, as an indeterminate life form, to produce, from the same genetic information ('genotype') different outward expressions that some people call 'alternative phenotypes'. Such different outward expressions also occur in a more strict sequence in the metamorphoses from juvenile to adult forms, which can set the scene for evolutionary transformation via neoteny. They illustrate how the phenotypes of life forms are dynamic, contextually transforming flow-forms capable both of influencing and being influenced by their living space rather than fixed objective entities operated upon by purely external forces.

Elementary botany textbooks describe how, in ivy, the shape of leaves (sometimes referred to as 'juvenile') on climbing stems is markedly different, having three or more lobes, from the shape of leaves (sometimes referred to as 'mature') on flowering stems, which are diamond-shaped. I had 'known' this, and taken it for granted, since my school days, but around ten years ago something

attracted my attention during a walk in the woods, which enticed me to look more closely.

My observations revealed a pattern that resonated strongly with a phenomenon that had interested me in fungal mycelia, whereby a colony that had been expanding relatively slowly and densely suddenly produced rapidly extending, fan-shaped 'sectors'. These sectors had always seemed to me to flow out from the 'parent' colony like an alluvial fan, a river delta or a scree slope from a mountainside. When I examined them microscopically I found that the hyphae they contained were relatively even-sized in diameter, branching sparsely and at acute angles to one another and thereafter closely aligned in near-parallel formations. By contrast the hyphae in the parent colony were much more uneven in size and erratic in branching pattern, with the branches tending to emerge from one another at relatively wide angles. In other words, the hyphae in the parent colony would branch like the tributaries at the head of a river, whereas those in sectors branched like the distributaries in the delta of a river. I had the sense of a gathering of potential energy in the parent colony, which was brought to a focus at localized centres on its margin and then splurged out. This kind of phenomenon in piles of sand has been the subject of quite recent mathematical modelling studies, where it has been referred to as 'self-organized criticality', following upon the non-linear thermodynamic thinking of Illya Prigogine. I, however, find such modelling unsatisfying as an approach to *explanation* of this phenomenon, as distinct from understanding the limits to its precise predictability, because it does not ostensibly include the role of space and inner-outer boundaries in the generation of coherent and incoherent organizational patterns.

What I found was that heterophylly in ivy leaves entailed much more than just the production of two different shapes of leaf. To begin with, there were many intermediary shapes between the extremes of strongly lobed and diamond-shaped. But it was not just the shape of the leaves that varied. Those on the flowering stems were a paler, more yellowish green and much glossier (due to

the presence of a waxy cuticle) than those on the climbing stems. Under the microscope there was also some evidence of a difference between the distribution and size of the breathing pores or 'stomata' that allow gaseous exchange between the inside and outside of the leaves: the leaves on the climbing stems appeared to be more permeable in this respect. But above all, there was a marked difference in the pattern of distribution of the veins in the leaves. The veins in the lobed leaves were much more uneven in size than those in the diamond-shaped leaves and branched erratically at wide angles. This distinction between a tributary-like pattern in the lobed leaves and a distributary-like pattern in the diamond-shaped leaves seemed to me to correspond with the gathering of energy in the more actively photosynthetic lobed leaves. This gathering of energy was released in the luxurious outburst of the flowering stems, like a fountain.

### ***An Inclusional View of Trees: Fountains of the Forest and Avenues to Decay***

Earlier, I described the course that had taken me from my childhood love of climbing trees, via my downfall, to felling them with a chain saw to study how their stumps got rotted. My eyes and feelings, in more ways than one, were cast downwards.

Shortly after becoming a Lecturer at the University of Bath in 1978, I found an opportunity to return to my original feelings. Wandering around a local woodland, wondering what way to turn in my research, I was struck, almost literally, by the litter of decaying twigs and branches that had rained down from the tree canopies following a recent storm.

I suddenly realized how much death, decay and shedding of branches were part of the life of a tree as its girth expanded and its canopy reached for the sky. Yet

so little seemed to be known about this process of 'natural pruning' and its contribution to the decomposition processes that woodland ecologists at that time thought occurred predominantly in or upon the soil.

I applied for, and to my astonishment was awarded (it wouldn't happen in these days of obsession with molecular mechanisms and protecting vested commercial interests) a grant from the UK Natural Environment Research Council to study the process. The grant enabled me to appoint a postdoctoral research assistant, Lynne Boddy, who had been inspired by my lectures about fungal population and community biology during the short time that I had been a Research Demonstrator at Exeter University. Lynne subsequently became a well-known and productive Professor of Microbial Ecology at the University of Cardiff, but her passage to that position, via her sojourn with me, was not without trauma, as I'll shortly relate.

It wasn't long before I found myself carrying ladder and climbing gear at the foot of a mature oak tree. I had thought that Lynne, being small and agile, would do the climbing whilst I directed from the safety of the ground, but Lynne had other ideas and dug her heels in! So it was that I, heart-in-mouth, neotenously re-entered the realm of my childhood, and not for the last time in my life, a new but strangely familiar world opened up in front of me.

Our studies of dead and dying attached oak branches revealed some very remarkable patterns of fungal population and community dynamics. Firstly it became clear that a group of a dozen or so species of fungi were typically involved in bringing about decay, and that each of these species had a distinctive ecological role and tended to thrive in a particular situation. For example species called *Peniophora quercina*, *Vuilleminia comedens* and *Stereum gausapatum* characteristically occurred in branches of progressively larger diameter and were limited at junctions between one branch size and the next. Moreover the extent of decay columns occupied by particular genotypes of these fungi was often very

large in relation to the amount of time they had had to colonize, sometimes becoming several metres long within a single growing season. These decay columns were often wedge-shaped and sharply demarcated from living sapwood by zones of prematurely formed, coloured 'heartwood', which would persist as long ridges on dead branches long after the sapwood had decayed. We called these long ridges 'heartwood wings' and they result in a very beautiful natural sculpturing of dead attached oak branches that anyone can appreciate if they are aware of what to look for.

The difficulty with these patterns was they didn't fit with the predominant theories of decay in trees at the time we were making our observations. These theories, which originated in North America, were based on the idea of trees defending themselves by forming a set of resistive, 'compartmentalizing' barriers, which excluded or confined the spread of decay fungi within their wood. Through my predilection for 'seeing' receptive space as well as material obstruction, however, we were led to a very different idea of what was *primarily* both opening up and directing possibilities for fungal colonization. This idea accounted not only for our own observations but also many other known patterns of decay in trees.

We decided to try to publish our idea and had a paper accepted for a reputable journal. Because of its interest to foresters, the paper was circulated as a pre-print prior to publication. Shortly before it was due to appear, we received a concerned letter from an authority within the Forestry Commission telling us it had met with an adverse reaction in America and advising us to withdraw it if we didn't want to risk our scientific reputation. Lynne and I had experienced our first real taste of what it means to present 'dangerous' ideas to an impositional mindset oblivious of context. Young, vulnerable and naïve, as well as a bit aggressive, as we might have been, we persisted. Ultimately, with some refinement and help from others, I think we did make a useful contribution to understanding the wider ecological context of tree decay processes. But what had we done to elicit such wrath and concern – much as I seem to have done

again and again, most recently in presenting my 'Life, Environment and People' course described in the previous chapter?

What we had done, in effect, was to question the American Way of imposing closure as a means of defending its own 'truth' against potentially disruptive 'aliens'! Rather than envisaging a tree one-sidedly, essentially, as a 'solid block' asserting its inalienable right to independent self-security by closing its boundaries to all-comers, we saw it as a 'host-space', a system of open invitations for others to find their homes, provided they could cope with the conditions therein. A short while ago, I wrote the following verse and painted the picture shown in Figure 15, based on this view.

### **The Attractions of Becoming a Host**

What I would like to be Most

Is a Well Coming Host

Raising a Toast

Without having to boast

To All those I love Best

From East and West

Providing a Nest

Where Each Can Rest

Assured in the Knowledge

Acquired in College

That Open Invitation

Is the Heart of a Nation



An Inductive Place  
With Scope for Grace  
Inspiring  
Expiring

In Dynamic Relation  
A Consolation  
That whatever Gives Out  
In a Roundabout  
Way  
So They say  
Can only Come Back  
Without any lack

But, I don't have a Ghost  
Of becoming a Host  
Unless I can Succour  
All Manner of \*\*\*\*\*

And I'd rather Not  
In case I might Rot  
And I want to Delay

When I'm due to Decay

By Fending Off  
All Those who might Scoff

So, Now I'm Alone  
I need to Atone  
For my Lack of Friends  
In a World with no Ends

Statuesque and Immortal  
Without Any Portal  
To Where I so long  
To Be Where I Belong

Within the Sea  
Of Eternity  
Beside the Hills  
Where Every We  
Expresses Me  
A Host of Golden Daffodils



**Figure 15.** 'The Attractions of Becoming a Host' (Oil painting on canvas by Alan Rayner, 2004). *A mysterious wooded vale between two hills invites*

*Wheatear in Spring to replace Fieldfare departing from Winter, under a day-night sky drawn together by a sun-moon and with Cuckoo and Vampire bat aloft. An ultramarine pool wells out of or into darkness, teeming with streaming parasitic forms but fringed by a crowd of rejoicing daffodils.*

In other words, we envisaged a tree as a nested holeyness of inner spaces connected with outer space through its bodily pipe-linings, commensurate with its function as a 'fountain of the forest' connecting an underground water supply with the outburst of its photosynthesising canopy. Hence we understood the *possibilities* for fungal colonization and consequent decay as being *guided primarily* by the *distribution* of the tree's pipe-linings and the *availability* of their internal spaces for inhabitation and permeation. In other words, fungal colonization is *channelled* along *avenues* of least resistance through the spaces within the trees' water-conducting pipelines, subject to the availability of nutrients and oxygen that can energize growth and decay. Since the presence of liquid water in functional pipelines restricts aeration, active decay can only develop in dysfunctional pipelines where water columns are disrupted.

Moreover, the process of decay itself creates and amplifies paths of least resistance, as fungal hyphae redistribute energy sources from the woody outside to the lumen within their cell wall boundaries, and so grow into the space that they create. We can therefore understand the development and distribution of decay in trees *primarily* by understanding the development and distribution of dysfunction – and how the spread of this dysfunction can be limited by 'host' responses or enhanced by fungal activities. From this understanding, we identified five distinct – but not discrete – scenarios for decay development in trees as follows.

1. 'Heartrot' occurs when the inner core of non-conducting 'heartwood' of a tree becomes decayed. This core often contains phenolic and terpenoid compounds as well as a gaseous regime rich in carbon dioxide, all of which can inhibit fungal

growth. The fungi that inhabit this core are relatively tolerant of these inhibitory agencies but, correspondingly, grow slowly. Nonetheless, over many years they can as 'individual' genotypes come to inhabit very considerable volumes – up to cubic metres – of wood, and convert this resource into the outgrowth of large, sometimes perennial fruit bodies. As the heartwood is decayed, it can become increasingly hollowed out and aerated, which in its turn provides opportunities for inhabitation by a gathering diversity of life forms including the trees' own roots.

2. 'Unspecialized opportunism', the scenario on which the American theories of 'compartmentalization' were largely based. It occurs when sudden death of or removal of bark cover, through disease or injury, exposes the underlying sapwood to drying and aeration. This enables a potentially wide variety of fungi and other micro-organisms to become established. Non-decay processes and organisms are often active prior to establishment of decay processes and organisms under relatively more aerated conditions. The pattern of dysfunction – and limitation of this dysfunction by boundary-sealing processes – influences the pattern of colonization and depends on circumstances both within and outside the tree. For example, wounds inflicted when water columns are under tension allow more colonization than when water columns are under pressure.

3. 'Specialized opportunism' occurs when decay fungi become established in apparently intact but dysfunctional sapwood of trees or parts of trees – as in the attached branches that Lynne and I were studying. These fungi often develop rapidly and extensively underlying strips or cylinders of dead bark, they often show strong 'preferences' for particular kinds or parts of trees, and are contained at valve-like junctions between branches of different order. They probably become established in a quiescent form as 'endophytes' within functional tissues, then become active agents of decay when the wood becomes aerated.

4. 'Desiccation tolerance' is characteristic of fungi that colonize aerated wood that has lost bark cover and so is subject to fluctuations of moisture content

dependent on atmospheric humidity. Such fungi have been little studied because they have little significance in terms of the commercial value of timber, even though their ecological significance may be considerable.

5. 'Active pathogenesis' occurs when fungi gain access to the host-space by directly bringing about dysfunction themselves, rather than relying on other agencies. It is, however, doubtful whether these fungi can ever truly independently bring about dysfunction, regardless of circumstances.

These five decay scenarios show how a more coherent understanding of fungal inhabitants of trees can be developed in terms of the availability and distribution of 'host-space' and *corresponding* patterns of growth and permeation. This understanding applies not only to potentially disruptive inhabitants but also to a very important group of fungi that may actually augment and enhance the trees' functioning as fountains of the forest, through their presence as absorptive accessories to roots. These fungi form what are known as 'mycorrhiza', which literally means 'fungus roots'.

Mycorrhizal fungi spread out into soil from the roots they inhabit. In so doing, they greatly extend the range and surface area of soil coming under the roots' influence, and so greatly increase the potential for absorption of water and mineral nutrients needed to supply the trees' upward and outward expansion. In return, the fungi are supplied with organic nutrients produced through photosynthesis in a classical reciprocal symbiotic relationship vital to any tree's ability to grow on unfertilized soil. As much as a quarter of a tree's photosynthetic 'productivity' is allocated to the support of its absorptive fungal accessories in this way. Moreover, the trees can indirectly support each other when their fungal outreach systems make contact with one another to create an underground network of the kind illustrated in Figure 3. But that is a story I will defer until later.

Suffice it to say here that there may be more to roots and branches than immediately meets the eye!

### ***What Makes a Branch? - Spray Forms and Splay Forms***

So, what most fundamentally makes a branch form? This is a question that naturally absorbed my attention in my efforts to understand the dynamics of fungal mycelial growth, in which branching is vital to the production of a form that can spread out radially in more than one dimension. It is also a question that has occupied many of my fellow mycologists, but whereas their focus, corresponding with the determinist intellectual climate of the day, was oriented to genetic mechanism, my feelings followed another direction, aligning with the dynamic distribution of flowing form.

My interest in flow-form *process* as the source of branching with which genetic mechanisms may interact, but cannot in themselves *determine*, was given an almighty shove by what was for me a very surprising finding made by my colleague, Martyn Ainsworth. Interested in the contrasting sexual and somatic responses to genetic differences in basidiomycete fungi, Martyn made some crosses between strains of a species known as *Stereum hirsutum* from England and Australia. The outcome was what a 'Pommie' like me might wish for, with all compassionate inclusionary feelings set aside, in a World Cup Rugby Final! Whereas the invasion of English territory by Australian nuclei was suppressed, the reciprocal invasion of Australian territory by English nuclei led to the collapse of the resident mycelium into a degenerate heap! And from the degenerating Australian body emerged a mass of extraordinary, long, branched, crystalline filaments of what proved to be a single, 'optically pure', sesquiterpene chemical compound known as (+)-torreyol.

The properties of (+) - torreyol were, to my mind, amazing. If heated to around 80 °C, it would sublime directly into vapour. As the vapour cooled, it would re-solidify into a variety of variably branched crystalline forms. Similar forms could be produced when the compound crystallised out from organic solvents. They elongated at their tips and branched if their extension was disrupted. The branching patterns of this structurally simple chemical compound, (+) - torreyol, were therefore similar in a wide variety of ways to those of plant, fungal and other life forms. This led me to think that the branching of the latter might be understood at a more fundamental physical level than genetic determination.

I began to reflect on what could elicit branching in *any* kind of flow-form, regardless of its specific material content. My mind turned naturally to the branching patterns of water-courses and my childhood joy playing with streams flowing across a sandy beach, which connected in turn with the 'bifurcation' patterns discovered in mathematical studies of non-linear systems culminating in 'Chaos'.

My conclusion was very simple. Branching occurs whenever the rate of energy assimilation into a flow-form channel exceeds the capacity for throughput to existing sites of output or expansion on the channel's boundary. Any impediment to flow will reduce this throughput capacity and hence induce branching. By the same token, any means of increasing the rate of assimilation into the channel, including any increase in assimilative surface area through growth, will be liable to induce branching. Moreover, two distinctive patterns of branching can be expected, depending on whether the channel is expanding at the same place as it is assimilating energy - whence the pattern will be tributary-like - or at a site of delivery from this place - whence the pattern will be distributary-like.

In tributary-like branching patterns there will be a tail-back of energy traffic from the growing tip of the channel until no flow is possible, at which point a branch will emerge, typically at a wide angle to the main axis, to release the

accumulating back-pressure. Such branching may not occur until some distance behind the growing tip, a phenomenon known to biologists as 'apical dominance', implying that the tip is imposing control and suppressing others within its vicinity. But actually, it is the relaxation of the tip as it simultaneously elongates and receives energy throughput, which ensures that there is no accumulation of back pressure until further down the channel, so it is more a case of apical yielding than dominance.

In distributary-like branching patterns, by contrast, branches emerge downstream from rather than at the place of uptake and so are driven out by forward pressure exerted by the flow itself, rather than back-pressure where the flow is prevented. Hence branching is at acute angles, and may even occur at the elongating tip of the channel itself to form a Y-shape, when it is described as 'dichotomous'. The branches are therefore splayed out like a fan or fountain rather than sprayed out like a Christmas tree with tributary-like patterns (known technically as 'racemose').

### ***Water Recycling - Collection, Connection and Distribution***

One of the most evocative 'true stories' I remember from my early school days was that of the water cycle. As the sun beat down onto the surfaces of lakes, seas and oceans, so some of the water would, I was told, evaporate magically into the air. As the warm, humid air rose, perhaps forced upwards by mountainous landmasses, it would cool and condense to form clouds. From these clouds would fall rain, hail, sleet, and, most excitingly, snow. Liquid water would then percolate underground or run over ground, eventually returning to the bodies it came from.

So I gained my first glimpse of the never-ending cycle in which the life of the world is caught up, a moving story of collection, connection, distribution, re-



collection, reconnection and re-distribution. Gradually, however, I came to comprehend how much more complex this story really was than the elementary one told to me by a teacher wielding yellow chalk for sun, blue chalk for water, brown chalk for land and white chalk for clouds. I realized the teacher had not used green chalk for the circulating bodies of water that form the lives of plants. He had also omitted the migrating pools of water that roam the landscape in the form of animal bodies, and those great hidden connectors and communicators that form the channels of fungal mycelia were, along with the tiny puddles within bacteria, nowhere to be seen.

Nevertheless, there it was - the contextual setting of a Grand Theme for the ever-transforming Life of Earth with myriad Variations, operating over scales ranging from microscopic to global. A Theme that so many of my biological colleagues seem to have lost sight of as they contemplate the evolution of abstracted, dry, purely genetic information along a linear Arrow of Time from Past to Future - a journey of 'solute' precipitated out of watery context. A journey of *unresolved* paradox, in which the Present is dislocated from the ever-circuitous, ever-shifting course I allude to in the painting shown in Figure 16. In this painting, the 'letters' of the 'genetic code' (C, G, A and T) are depicted as inclusions of streams of rich and varied life outpouring from the black and white, neatly tied up certainties of absolute confinement and central control.

I



**Figure 16. 'Future Present'** (Oil painting on canvas by Alan Rayner, 2000). *The gift of life lies in the creative infancy of the present, whence its message from past to future is relayed through branching watery channels that spill out and recombine outside the box, re-iterating and amplifying patterns over scales from microscopic to universal.*

**Water Courses Here, There and Everywhere**

The more I have combined my seeing of life as an observer with my feeling for life as a flow-form, a dynamic inclusion of watery space, so I have sensed the presence of water courses here, there and everywhere within the biosphere. This sense fills my inner body with a feeling that I can only describe as a fountain of joy, which has borne me through some very difficult passages and that I ache to share as I survey the arid wasteland that modernity seems to have made of Life on Earth.

In all creatures, great and small, I sense the presence of those tributary-like branching channels that harvest sources of energy from their outer world. I sense them in the membranous and tubular inclusions of all kinds of living cells. I sense them in the blood-collecting veinules of capillary beds, in the dendrites of nerve cells, in the roots of plants and in the veins of photosynthesising leaves. I sense them in the trails of all kinds of motile organisms from slime bacteria to wildebeest assembling for migration or foraging for food and hyphae of fungal mycelia growing in nutrient-rich locations.

Then again, in all creatures, great and small, I sense the presence of those distributary-like branching channels that distribute energy supplies from one place to another. I sense them in the inclusions of living cells, in the blood-distributing arterioles of capillary beds, the pre-synaptic terminals of nerve cells, the inflorescences of plants, the veins in flowers and fruits, the spread of migrating organisms to new pastures and hyphae of fungal mycelia surging into new territory.

Then, yet again, in all creatures, great and small, I sense the presence of connective channels that join assimilative (energy-gathering) with distributive locales. I sense them within the lumens of living cells, major blood vessels, nerve axons, plant runners, stems and trunks and their internal pipelines, trunk routes of migrating organisms and fungal mycelial cords and rhizomorphs.

## ***Imaginative Trees - Courses of Thought, Learning and Evolution***

The branching of living systems is not, however, confined literally within the immediate bodily linings of their watercourses. It also extends beyond those linings in the imaginative, indeterminate processes of thought, learning and evolution that lead to diversification of all kinds. Only when we confine imagination within a fixed frame of reference will it follow a linear path, and even then, pushed hard enough, it may proliferate strangely and fractally, like a Mandelbrot set. Liberate it from such confinements and away it goes, exploring all over the place!

Who hasn't felt the joy of allowing the mind to wander in this way, full of wonder, never knowing what surprises and difficulties and discoveries await? This is the essence of evolutionary creativity, an experiential learning process that is by no means random and unbounded. It accumulates information and complexity as it creates and follows spaces of least resistance, mediated through its dynamic guide-linings. Life becomes autocatalytic, more and more accomplished as it roots and branches like a tree, expanding its influence, building cumulatively upon the foundations of its own dynamic structure.

But even then, that's not all there is to branching, for the branches only prepare the way for a yet more powerful kind of dynamic structure to emerge when their boundaries coalesce – a flow-form network. I will reflect on the extraordinary properties and potentials of flow-form networks in the next chapter. But first, I want to reflect on a very different perception of branching, one which comes from viewing it analytically, purely in terms of material structure rather than as a dynamic product of electromagnetically lined space. A perception that leads us to believe in false dichotomies – the imposition of either/or *choices* that we feel obliged to make as we journey through life.

### ***Nodal View - The Point of No Return?***

Whilst pondering the deeper origins of branching in living systems, I remember once asking one of my biological colleagues what he thought. His immediate, unequivocal answer took me by surprise. 'A branch', he intoned, 'is a decision point'. 'Oh,' I said, strangely feeling simultaneously impressed and depressed, and wandered off, my head reeling.

My colleague's answer came at me like a bolt out of the blue because, strange as it may seem, I had never thought about branching that way. My natural empathy for whatever I am observing had led me to regard branching, as I have described above, as an automatic response to inner-outer situation, not the product of some internal or external 'to branch or not to branch' calculation. True my experience as an externally situated tree-climber or internally situated route-navigator might regard a branch as a place where *I* might have to make a choice, but I could not regard a branch *itself* to be the result of a decision to split.

As I think more about this question, so my colleague's answer seems to reveal a pattern of thinking that follows from the abstraction of the observer from the observed, so that the latter's behaviour becomes decontextualized, making it seem to result from some form of conscious internal calculation. Hence we may attempt not only to *model* or *simulate* nature by means of abstract mathematical calculations, which is one thing, but even to *explain* nature as the *product* of mathematical calculation, which is quite another. The reality of nature becomes substituted in our minds by our abstract mathematical model of it. I have even heard the universe described as a 'mathematical system'. Following the advent of selfish gene theory, the ability of organisms to undertake fiendishly difficult calculations of costs and benefits to their evolutionary fitness, way beyond the capabilities of most human brains (notably mine!), is quite remarkable.

In biological terminology, the place where a branch emerges is known as a node. But as will become apparent, there are very different opinions concerning whether this place arises as an induced response guided by local situation or as an assertive action made to gain some objective advantage. The latter idea leads inexorably to the treatment of a node as an 'executive control centre'. As I will show in the next chapter, this treatment underlies a way of thinking about social organization that currently dominates human systems of governance and communication. It inverts the natural relationship between branching and the most powerful form of biological organization known.

## **6. Networks - Traps or Delivery Systems?**

## ***Be Wary of Spiders - The Trappings of Constructed Networks***

About ten years ago I remember joking to some mathematician and biologist friends that the Universe is a mycelium! Many a true word is said in jest, they say, and my joke had a serious intent. My years of studying the growth and interactions of fungal colonies had led me not only to become very impressed by their extraordinary dynamic potential. I also imagined how hard it would be for some inhabitant nucleus or mitochondrion within a mycelial network to be 'aware' of its real situation. By the same token, I imagined how hard it would be for human inhabitants of the cosmos to appreciate what our situation might really be without being able to get beyond it, and how this one-sided perspective could provoke all sorts of misleading conclusions.

After all, look how long it took us to appreciate that the Earth isn't flat, and then that the Earth isn't at the centre of the solar system. Transcending these 'objectifictional' fixations took enormous leaps of imagination beyond the self-excluding distance and limits imposed by our binocular vision. Once we had made these leaps, we could make a new kind of sense of the world and our place in it. From these new positions, the old, fixed ways seemed naïve and to generate unnecessary complications and paradoxes, like Ptolemy's epicycles used to explain the apparently erratic path of the planets based on assuming that Earth is the fixed centre of the solar system.

But like addicts in search of their next fix, unable to unhook ourselves by allowing the dynamic uncertainties of space back into our lives, we are still prone to forsake our imagination again and again in order to return to the concrete path on which we feel secure. We congregate like moths around a source of illumination, only to become trapped as we congratulate ourselves on seeing the light in an objective, loveless way. Meanwhile, what really takes imagination is seeing the relational darkness that both pools and is informatively lined by the light of



universal flow-form. I allude to this in the following lyric, which goes along with the image of 'Holding Openness' shown in Figure 11.

### BEYOND OBJECTIFICATION

You ask me who you are  
To tell a story you can live your life by  
A tail that has some point  
That you can see  
So that you no longer  
Have to feel so pointless  
Because what you see is what you get  
If you don't get the meaning of my silence  
Because you ain't seen nothing yet

You ask me for illumination  
To cast upon your sauce of doubt  
Regarding what your life is all about  
To find a reason for existence  
That separates the wrong  
From righteous answer  
In order to cast absence out  
To some blue yonder  
Where what you see is what you get  
But you don't get the meaning of my darkness  
Because you ain't seen nothing yet

You look around the desolation  
Of a world your mined strips bare  
You ask of me in desperation  
How on Earth am I to care?

I whisper to stop telling stories  
In abstract words and symbols  
About a solid block of land out there  
In which you make yourself a declaration  
Of independence from thin air  
Where what you see is what you get  
When you don't get the meaning of my present absence  
Because you ain't seen nothing yet

You ask of me with painful yearning  
To resolve your conflicts born of dislocation  
From the context of an other world out where  
Your soul can wonder freely  
In the presence of no heir  
Where what you see is what you get  
When you don't get the meaning of my absent presence  
Because you ain't seen nothing yet

You ask me deeply and sincerely  
Where on Earth can you find healing  
Of the yawning gap between emotion  
And the logic setting time apart from motion  
In a space caught in a trap  
Where what you see is what you get

And in a thrice your mind is reeling  
Aware at last of your reflection  
In a place that finds connection  
Where your inside becomes your outside  
Through a lacy curtain lining  
Of fire, light upon the water

Now your longing for solution  
Resides within and beyond your grasp  
As the solvent for your solute  
Dissolves the illusion of your past  
And present future

Now your heart begins to thunder  
Bursting hopeful with affection  
Of living light for loving darkness  
Because you ain't felt nothing yet

So it may be that there is something inexorably objectifictional about the way we currently tend to visualize communications networks as gatherings of localized 'nodes' interconnected by invisible threads to form a 'web'. As any competent spider will inform you, far from enhancing the flow of information, such constructions actually form an excellent trap. They are great as resilient frameworks for gathering in sources of energy, but useless as distribution systems, capable of spreading their influence and enabling further explorations by others. This is because a well-connected node – sometimes described as a 'hub' – in such systems effectively hoards power and so disrupts and impedes flow. 'Nodes' and 'webs', as they are conventionally constructed and represented, form powerful energy sinks or establishments, which limit rather than enhance evolutionary potential by controlling and restricting the flow of information through local centres. They are respectively both bottlenecks and full of bottlenecks, like our gridlocked road and electricity supply systems - fixed frameworks predisposed to overload.

***Inclusional Networks - Dynamic Flow-Forms***

From an inclusional perspective, effective *communication* networks are understood to be very different from the space-excluding artefacts of thread-like links and knot-like nodes of our current restrictive constructions. There is an immense variety of these communication networks to be found in the natural world. They range from those within 'individual' organisms, e.g. fungal colonies, slime moulds, nervous systems, blood systems and leaf venation patterns, to those found in such 'collectives' as army ant swarms, wildebeest herds and all kinds of natural ecosystems.

Inclusional communication networks can be thought of as 'communities of common space' and they characteristically have the form, explicitly or implicitly, of interconnected riverine or labyrinthine channels or tubes with variably permeable and deformable inner-outer boundary linings and internal partitions. In other words, they are what my research colleague, Karen Tesson, describes in her PhD thesis as 'flow-form networks', which emerge both as manifestations and facilitators of information flow in the dynamic context of space. They are like the network of included dark space shown in Figure 11.

My many years spent studying the dynamic properties of living flow-form networks illustrated by fungal colonies (mycelia), led me to identify a number of principles that may be generally applicable to all kinds of naturally evolving collective organizations.

### ***Relaxing Boundaries - the In Formation of Inclusional Networks***

The first of these general principles is that rather than being formed by stringing together a given set of initially independent entities, flow-form networks *grow into place* through a combination of *self-differentiating* (boundary-maximizing) and

*self-integrating* (boundary-minimizing) processes that respectively *break* and *restore* the symmetry of *primarily curved* energy-space.

Correspondingly, as discussed in the previous chapter, when a fungal spore germinates, it expands spherically before breaking symmetry to give rise to a *dendritic* (tree-like) system of hyphal branches that radiates out in all directions. But this is only the first part of the story. Later on, in many fungi, something happens, which I have always regarded as quite wondrous. As external resources are depleted by the growing system, some of the branches within its interior begin to converge upon one another, come into contact and then *fuse* or *anastomose*, producing a labyrinthine network of space-including tubes. During this process, the branches open up their external boundaries to one another, so that the discontinuity of external space initially *between* them becomes the continuum of space *within* them. In other words, they 'relax' their differentiated self-identity 'agenda' in the process of joining forces by self-integration. My colleague, Martyn Ainsworth, once managed to capture this process on film, and both he and I were amazed to witness the violent physical recoil as one branch joined with another.

Within this integrated system the branches do not disappear, they retain their form as connective channels of internal space. What are known technically as the *nodes* in this system are hence the places from which the branches originally arose, rather than the loci of initially discrete entities. Correspondingly, the branch-identities are the links in the system, not the 'knots' or local centres through which network transactions are administratively controlled. At no stage in the development of the system have these identities been *fully* dislocated from one another or the pool of common space in which they are immersed and of which they are dynamic inclusions.

## ***A Form of Immortality – The Endless Possibilities of Indeterminate Networks***

By *growing* into place, these dynamic systems exhibit *indeterminacy*, the potential for indefinite expansion and transformation within boundaries that vary in their *deformability*, *permeability* and *contiguity* depending on contextual circumstances. Whilst the interior of the system becomes anastomosed, branches around the periphery remain free to explore further.

This pattern of development contrasts with the *determinacy* assumed by many to apply to creatures like ourselves, sentenced to death within a fixed frame of bodily space and time and bustling through life as if there were no place else to care for, notwithstanding the continuum of our social space. Correspondingly, some fungal mycelia are thought to cover up to square kilometres of ground and to be thousands of years old. They are truly ecologically sustainable, self-renewing systems.

By contrast, constructed networks have a limited life span. They are liable to fall into disrepair unless continually maintained by their constructor, as the feverish efforts of spiders and other kinds of ‘webmasters’ bear witness to. Moreover, constructed networks can only enlarge by adding on to their existing framework, a process that may ultimately strain the system beyond its holding capacity and engender its collapse, like a pack of cards. In such ways do empires and civilizations built on space-excluding foundations rise and fall.

## ***Mushrooming Networks - Centres of Re-emergence***

By connecting their internal space simultaneously *in parallel* rather than purely sequentially *in series* (as applies to dendritic systems, lacking anastomoses/cross links), flow-form networks greatly increase their conductivity

and consequent capacity to store and supply power at or to localized sites on their boundaries. In fungi, this increased capacity is what allows mycelial systems to produce fountain or root-like outbursts of growth, including mushrooms.

On the other hand, mycelial systems that lack or lose the ability to form anastomoses are prone to become dysfunctional and degenerate, with numerous branches proliferating from local nodal sites. My colleague, Martyn Ainsworth once isolated such a dysfunctional system from a 'mating' he made between a strain from what was then the Soviet Union and another strain from the USA. We joked that Reagan had made Gorbachev very cross and incoherent! The degenerate colony actually looked very similar to some of the 'maps' that have been made of the Internet using purely abstractive analytical techniques based on conventional network theory. Spookily, the whole dissolute political framework that had been known as the Soviet Union collapsed shortly after these experiments - perhaps revealing the inherent dysfunctional properties of joined up hubs lacking lateral communication channels with others!

### ***Learning Networks - Re-Collection, Re-Connection and Re-Distribution***

In the early 1990s, a few years after Martyn Ainsworth had made Gorbachev cross, two final year undergraduate project students, Erica Bower and Louise Owen, started a series of pioneering experiments. They grew fungi in a matrix of twenty-five 1 cm square plastic chambers containing alternating nutrient-rich and nutrient-poor media. Each chamber in this matrix was connected to each of its neighbouring four (or three or two for peripheral chambers) by a narrow gap in its containing partition, cut just above the level of the growth medium, through which the fungus could grow. The resulting growth patterns were extraordinarily revealing and, to my mind, also extraordinarily beautiful. One example, produced by the 'Magpie Ink Cap', *Coprinus picaceus*, subsequently made an appearance in several books, including my own 'Degrees of Freedom' as well as the front

cover of the symposium volume, 'A Century of Mycology', produced by the British Mycological Society to celebrate its Centenary.

What I found so personally inspiring about these growth patterns was how they seemed to relate to so many of my own lifelong learning experiences as they attuned with their ever-changing local circumstances by producing extraordinarily efficient communication pathways. To observe them in the process of formation, as my colleague Zac Watkins managed to do using time lapse photography, was like watching a sensitively feeling kind of thought process unfold, full of imagination and receptivity to new possibilities. In this process structure emerged dynamically, only consolidating into persistent connective channels as a kind of 'afterthought'. In other words, the structural boundaries of the colonies formed dynamic guide-linings rather than prescriptive constraints as they flowed through the heterogeneous 'landscape' they found themselves in.

I felt that those inhabiting the control centres of human administrative systems could learn much from these patterns about how to be receptive and responsive to local context rather than impose insensitive 'objective' decisions from afar. To add insult to injury, such decisions are often made alongside the disingenuous claim to have 'consulted' local communities by asking whether they agree with a plan presented to them as a '*fait accompli*', rather than engaging in a dialogue about what they think is actually needed. Correspondingly, Tony Blair's idea about consulting the United Nations regarding the possibility of war with Iraq was to give the UN an opportunity to agree with his plan, not to offer them (let alone Iraqis) a chance to express their own view. The option presented was actually an ultimatum: either you agree with my plan, or I will go ahead without you and attribute this to my courageous independent 'leadership'.

My feelings were intensified by watching bulldozers gouge around the base of Solsbury Hill, a beautiful local landscape feature near Bath, in order to make way for an unnecessarily expensive and cumbersome 'Batheaston by-pass', heedless



of the protests, embodied knowledge and sensibilities of local people. The view of this hill from her bedroom window was much beloved by my daughter, Hazel. It had been featured in a hit pop song by Peter Gabriel, and I used this as a basis for one of only four paintings, the one shown in Figure 17, I made in the years between 1975 and 1997.



**Figure 17. 'Solsbury Hill'** (Oil painting on board by Alan Rayner, c. 1990).

*Painted for my daughter, Hazel, based on the scene she loved from her bedroom window of the ancient hill fort of Solsbury Hill, and drawing from the lines of the Peter Gabriel song about that hill, 'an eagle flew out of the night'.*

So, what was it then that I actually saw in the growth patterns of fungi in the matrix, which, had its implications been understood, might have saved Solsbury Hill from grievous bodily harm? To begin with, hyphae within a nutrient-rich chamber would radiate outwards, branching profusely. Upon encountering a gap leading into a nutrient-poor chamber, they converged together before surging out into the chamber like water flowing through a gap in the boundary of a dam. A similar pattern of convergence and outward surging followed when growing

through gaps into neighbouring nutrient-rich chambers, but was accompanied by dense proliferation of branches.

Once connection had been established between nutrient-rich chambers neighbouring a nutrient-poor chamber, some remarkable patterns of redistribution began to emerge in the latter. In one fungus, *Coprinus radians*, small toadtools developed. In the Magpie Ink Cap, *Coprinus picaceus*, cable-like parallel arrays of hyphae began to form along the routes connecting between the gaps leading into neighbouring nutrient-rich chambers. These cables formed in a way that was reminiscent of a lightning strike, spreading both outwards and backwards from each end to meet one another. Moreover, they formed in directions not only 'with' the original outward flow of the expanding colony, but backwards, 'against' the flow. In this way an extraordinarily beautiful communications network was formed, purely through the ability of the fungus to vary its boundary properties in accord with local circumstances and hence gather in, distribute and redistribute its energy supplies between places of plenty and places of shortage.

Perhaps of all these patterns of redistribution, the one that struck me most powerfully was the development of the cable-like connections along paths of exploration that 'successfully' linked the openings between neighbouring chambers. In this way the fungus was both amplifying and consolidating the path of greatest opportunity through which its communications could be sustained and enhanced. It was forming an autocatalytic (self-amplifying) channel of communication through which *flow progressively decreased resistance to flow* and increased the persistence of the structural boundaries that both emerge from and guide the flow, as with the banks of a river. I regard such autocatalytic flow as a hallmark of cumulative learning processes that engender increased powers of recollection - in a word, 'memory'. I feel the fungus is showing us how we can and do learn. Indeed, I understand that similar kinds of processes, leading to the amplification of synaptic connections along particular pathways, occur during maturation of our own human brains.

There is, however, an implicit danger in such self-amplifying processes. They only remain viable as long as the opportunity terrain in which they are occurring does not change - which is impossible in the long run because of the coupled reciprocity of inner and outer transformation in all dynamic systems, whereby change begets change. Hence, as the communication channel becomes more and more entrenched and persistent, so the possibility to alter course in altered circumstances becomes reduced - the channel becomes a rut, an addictive pattern to which energy supplies are diverted until and unless its boundaries begin to degrade. Fungi show us not only how to learn, but also how to get out of a learning rut - how to unlearn and hence how to take the process into new territory by allowing the solvating power of space to degrade redundant informational linings.

### ***Iconoclastic Networks - the Power of Forgetting***

Some years before the matrix studies, another of my associates, Chris Dowson, had been studying fungi capable of producing extensive, easily visible mycelial systems, consisting of dense 'mats' and cable-like 'cords' and 'rhizomorphs' in woodland soil and litter. These fungi inhabited a heterogeneous domain, of the kind simulated by the matrix experiments, in which local supplies of nutrients – in the form of leaves, twigs, roots, branches etc - were distanced by variable amounts of intervening, nutrient poor mineral soil-space. How, Chris asked, did these fungi make connections between the nutrient-rich 'oases' without wasting their energies in the 'desert'? He devised a series of experiments, showing how these fungi attuned their pattern of explorative growth to the richness and frequency of the oases. These experiments involved inoculating mycelium growing actively on a suitable food source (e.g. a wood block) into a tray of soil, and placing one or more uncolonized 'baits' some distance away. The fungi spread from source to bait by means of a variety of distinctive patterns or

'foraging strategies' that differed between species in ways that were clearly related to their natural habitats. These patterns have subsequently become the focus of a major field of fungal ecological study by my erstwhile colleague, Lynne Boddy, who co-supervised Chris' work.

Chris not only saw the kinds of redistribution processes that I have described above in the matrix experiments. He also found that these processes depended to varying degrees, according to 'foraging strategy', on the ability of non-connective mycelium to degenerate and pass on its resources to connective mycelium. Death was playing an important part in the efficient redistribution of energy through the mycelial collective. Only the *least* autonomous, *most* interdependent explorative and communicative channels were conserved, whilst others yielded their internal resources to their neighbours as external supplies dwindled. So much for survival of the most independent!

One of the most graphic illustrations of the iconoclastic role of death in sustaining the explorative potential of fungal colonies is found in 'fairy rings'. These rings consist of an annulus of spreading, explorative mycelium, which is superseded in turn by an 'assimilative' zone that actively digests and absorbs nutrients from its surroundings and a degenerating trailing margin where hyphae die off as the colony continues to expand. Chris made some ingenious transplantation studies with a fairy ring-forming fungus called *Clitocybe nebularis*, which grows amongst the leaf litter in deciduous woodlands. He showed that if a block of mycelium was cut out of the annulus and replanted behind the trailing edge, or outside the annulus, or in its original orientation within the annulus itself, then the hyphae would continue to grow in the same direction as they already had been doing. If the block was turned through 180 ° before being replaced in the annulus then it died, leaving a persistent gap in the growing margin. In other words, he showed that a polarity was established in the colony that sustained outward exploration as a 'travelling wave' from a dying zone, through a feeding zone, to an explorative zone.

Some years later some colleagues and I were able to show mathematically, using a non-linear 'reaction-diffusion' model, how degeneration of the centre of a flow-form network and release of its resources to supply the growing margin was vital to the expansion of the system. In the absence of such degeneration, expansion of the consequently 'constipated' system stalls. There is 'gridlock'.

So it seems that in flow-form networks there are places both for remembering and for forgetting. Too much remembering results in gridlock, an overly retentive system that gets caught up in the density of its own self-integration. Too much forgetting leads to dissolution and a loss of capacity for learning.

Trying to strike the appropriate balance between remembering and forgetting has been a major issue for me personally, as I imagine it has for most of us, and it is not just the individual, but the collective that this issue concerns. I wonder how much creative potential has been trapped in human history by clinging onto the '*status quo*'? And how much wisdom has been lost in the rush to advance?

I was reminded of this dilemma recently when preparing to travel to Ireland for a summer holiday. What is it about us, I found myself reflecting, which needs first of all to 'go away on holiday' and then to record it for 'posterity', whomever that might be? Some strange cocktail of escapism and security that epitomizes our bodily lives caught in the middle between material attachment and soulful liberation, home and away, safe and adventurous. Why can't we just 'let it all flow', without recourse to the discourses of memory which feed the commercial paraphernalia and tacky trappings of the tourist industry? What, as I will ask again in the last chapter, is this hang-up we have for permanence that in its dull imposition upon our life experience simultaneously inspires our mortal longing to get away from it all - whatever the risk, whatever the cost, again and again?

Perhaps this really is what is so vital to the learning experience of our creative human nature - living with the uncertainty of space in our midst whilst holding it both within and out of bounds: exciting but frightening, harmonious but becalmed. The trouble starts when we cease holding our excitements and confinements together in dynamic reciprocal balance. When we pit one against the other, obliging ourselves to choose this way or that or even, with deep inconsistency, this way as the *means* to that. Then, the spirit suffers, in one way or another, trapped in *nostalgia* or *painfully* exposed.

So, how then to hold on to our spirit of adventure, without losing the plot? How to make a record without getting stuck in the groove? How to let go without forever abandoning our learning experience?

This dilemma may explain why when we try literally to *capture* our experience, be it on film, in personal journals, in our descriptions to others or simply within our own memory circuits, some essential quality of the live encounter dies. Nothing can substitute for the original. It cannot be transferred, lock, stock and barrel from one place to another. Those photographs we took all look disappointingly *flat*. Somehow all those unpredictable, sometimes painful, spatial intrusions that we *felt* in the moment, bringing an electric sense of relief to our experience, get smoothed out by our recollections or revisits. To misquote Heraclitus, we can never step in the same river twice without the river losing all its excitements and becoming, well, boring. Unless, somehow, we can *evoke* the spirit of the first encounter, not by confining it within a fixed frame, but by holding it open to its attendant uncertainties. We need to *recreate* rather than *reproduce* it by finding a way to *play* with our memories, by keeping them young, just as sex plays with genes as it refreshes the world with its offspring, providing room for evolution.

So, as my wife, Marion, and I set out for our holey days in Ireland, I pondered how I might play with my memories of the experience. I decided to play with words. On each day, I would try to write at least one poem. That seemed in

keeping with the spirit of the place. Here is my poetic recollection of the first three days of the experience:

### **Day 1**

Marion and I took flight from Bristol to Dublin, and then guided a hire car, with me anxiously at the wheel, through what was at first horribly heavy traffic, to Kilkenny. Without air conditioning, our hotel room proved to be stiflingly hot following a recent heat wave. Funny how our holidays so often seem to *follow* or *precede* a heat wave! But we were told not to open the windows for fear of insects flying in from the nearby river.

### ***Overheating***

Space seeps from outer to inner  
Through pores that gasp for refreshment  
Of an expanding body  
That swelters in the still air  
Of a night sealed off  
From the relieving breeze  
Of a world beyond thick curtain linings  
Draped across windows barely opened  
For fear of insects breeding  
In the humidity of the river's slow meander

Let me out, let me out!  
The trapped space cries  
From within the burning body  
Whose pores respond

By gaping open further still  
Only to let more heat in  
From the enveloping furnace  
As the body swells relentlessly  
In the brooding darkness

Water! Water!  
The body yearns to slake its thirst  
By drawing out the dense invading dryness  
Of its cramped, stagnating form  
In a cooling evaporative surface  
A cloud set sail in elemental air  
Shrinking back from the ghost  
Of its movement above a temperature  
Far removed from norm.

At last day breaks open the windows  
As their curtains are withdrawn  
To bathe the restless body  
Still aching sorely from the night  
In piercing shafts of bright sunlight  
The body lifts its weary spirits  
Aware of its need to face the day  
And takes a shower.

## **Day 2**

Marion's birthday began with a crisis as her camera failed, due to exhausted batteries. With snap-happiness restored, we wandered the medieval streets,



Castle, Abbey and Cathedrals of Kilkenny, as well as its shopping precincts and pubs.

### ***Hot Foot***

The town awaits the expectant tourist  
Its many attractions lined up sweetly  
Along cobbled streets set out to test  
The endurance of shoe leather  
Prepared to beat the sudden onslaught  
Of any kind of unkind weather

And so the busy tramp begins  
To wander curious round every corner  
In search of wonders to fill full  
That strange, beguiling inner craving  
That sends feet stalking over paving  
From here to there but sadly never  
Quite revealing everywhere

The quest begins deep in the silence  
Of ancient modern Cathedral spaces  
Juxtaposed with shopping precincts  
Each vying to receive the instincts  
That long to find some thing elusive  
They can take back to show  
The world where they have been

Onwards, onwards, drive the feet  
As goods and services fail to meet

Demands for yet more inside knowledge  
Captured on film if not in memory  
Aided and abetted by eager tour-guides  
And endless word-strewn museum passages  
Filled with every manner of device  
To rest assured the empty mind

Hotter, hotter, fit to blister  
Strive the feet with every stride  
To satisfy that need for pride  
With spirit flagging on the flag stones  
At last they find a place to step aside  
From the beaten track  
A chance to rest and reflect with pleasure  
Upon a day designed for leisure.

### **Day 3**

Marion and I drove down to Waterford, but felt disappointed by the sparseness of rewarding places to see or visit amidst noisy traffic. So we drove south to the active fishing port of Dunmore East, where there were large numbers of kittiwakes inhabiting the cliffs.

#### ***Kittiwake Harbour***

A strange recalling  
Half-familiar, half unfamiliar cry  
Seagulls crossed with cat  
Whirring and wheeling above pea-green inlets

Into red rock banded in classical zones  
From thongweed and kelp  
Through barnacles to spiral and channel wrack  
Then tar and orange lichen  
Until, nesting in holes  
Sprayed beneath by their own encrustations  
Young and old crowded together  
With diagonal wing stripes and soft, snowy heads  
They sound off into the air

An exuberance of noise  
Shrill between wing-beats  
Rising and fading in turns  
As unseen currents  
Hidden beneath calm surface  
Softly slaps hard rocks  
In living reprimand  
For their intrusion  
Like slivers into silvered space  
Cutting with their serrations  
But all the while  
Eroding into lesions  
To which the kittiwakes return

***Inclusional Networks Here, There and Everywhere - Is the Universe a Mycelium?***

So, did my words spoken in jest actually have some truth in them? Could the Universe really be a mycelium - a gathering of worm (or mole) holes, so to speak?

What does seem clear is that, flow-form networks are both figuratively and literally a ubiquitous feature of natural organization. In the natural dynamic geometry of nested holeyness, every complex self-identity is *both* an inclusion of smaller networks *and* included within larger networks of flow-form channels. To visualize this situation we need only find an imaginative way to see with the feeling mind's eye solvent space as well as solute lining in the natural dynamic solution of nature, from sub-atomic to universal scales. As hard definitions are thereby relaxed into fluid distinctions, what at first appear in a fixed viewing frame to be independent, solid objects are transformed into the shape-shifting channels of a universal holey communion. Not only do we see the multifarious dendritic 'trees' described in the previous chapter, we also see the 'wood' of networked spatial inclusions that these trees both contain and are contained within. We see the self-differentiation of branching out combining creatively with the self-integration of gathering in, as space pools both from inside and outside in an ever-evolving contextual transformation.

### ***Deliverance From Dust: Beyond The Random Points of No Return?***

But what happens to our perception of irreversible dynamic processes if we don't, won't or can't see the inclusion of space in this way and stick to our hard definitions of discrete entities surrounded and isolated by empty space? Then the 'space between', which becomes the 'space within' upon anastomosis of neighbouring channels, is seen only as a source of incoherence.

Space becomes an alien invader of the concrete certainty of the 'natural order', an inexorably destructive absence of presence in which 'things' can only break down. The branching out of life and the universe is hence seen only as part of an irretrievable process of decay within an increasingly uncertain regime - a process of dividing down that culminates in dust. Indeed the product of such a fractal

process of subdivision imagined by the mathematician George Cantor, the originator of 'set theory' actually became known after him as the 'Cantor Dust'.

In this view, the ultimate freedom to be anywhere, any place, any time is bought at the expense of utter incoherence, utter randomness. This is an anarchic, entropic state of absolute independence from which the emergence of any kind of sustainable internal 'order' is infinitely improbable.

Randomization is hence set as the default process towards which nature is predisposed to wander erratically in the absence of external intervention. It is not a large step from this view to the notion that order must therefore be imposed by external force, which is the basis for authoritarian governance and the search for and establishment of rules and laws.

One way in which space has ironically been included in our mathematical accounting for the disturbing variability and unpredictability of nature has therefore been in terms of 'stochastic' or 'statistical' models. The premise of these models is the infinite independence of dust particles as local entities or events that nonetheless (and paradoxically) have distribution patterns fixed within discrete intervals of space/time and are characterized as discrete numbers or degrees of freedom. Hence a degree of certainty or probability in predicting the occurrence of these events or entities within a particular space/time frame can be calculated using conventional mathematics. We deal with error by assigning a particular probability function to it, the most common of which has the form of a bell-shaped curve or standing wave.

The problem here is that these statistical models are only useful (and there is no denying that they *can* be useful) in a defined probability space, such as the likely outcomes of rolling a die, and hence in the short term. They do not and cannot represent a dynamically framed realm of evolutionary possibility, any more than can the deterministic non-linear models based on assumptions of initial

conditions that I described in an earlier chapter. If used together with the deterministic models, however, and with an inclusional awareness of their limitations and foundational premises, they may contribute to a deeper understanding of the kinds of evolutionary patterns that we can anticipate, if not precisely predict, in our ever-changing living space.

By treating space, consciously or unconsciously, only as an external intrusion into solid certainty, we lose sight of its role in processes of 'remembering' through self-integration of dynamic boundaries - when the space between becomes the space within. We focus only on the seeming fragmentation that culminates in the incoherent dust of an increasingly empty, self-forgetful, featureless Universe. But the fungi growing in the matrix show how just as those processes of branching out begin to become unsustainable, so complementary processes of recombining set in, retaining scope for further exploration as circumstances change. Such is the possibility included by flow-form networks, that points of no return from Dust may never need to be reached. Water driven to expand into forming vapour re-condenses as it cools and pools out of thin air.

## **7. Farewell to Arms - The Dissolution of Human Conflict?**

## ***Journeying Through No Man's Land***

One way or another, so many of our human lives seem to revolve around conflict. My own life has been no exception. I was born into the nightmare of the Mau Mau uprising in Kenya during the 1950s, in which my mother's political prominence made her and her family a target. My mother herself had journeyed from England to Africa during World War 2, on a merchant ship loaded with explosive and shadowed by submarines, in order to marry my father whom she had angrily broken her engagement to on no less than three occasions. Her spirited, intuitive, anxious nature was frequently at loggerheads with the hard scientific rationalism and volcanic irascibility of my otherwise gentle, profoundly knowledgeable, diligent and sensitive father. Crockery flew between them and it was not uncommon for my sister or me to get caught physically and/or emotionally in their crossfire in a marriage that nonetheless endured 58 years until my mother's death. Their apparent expectations of me to be perfect, both morally and academically, gnawed into me as my own self-expectations followed suit, bringing me into profound conflict with my human frailties and needs. I developed a powerful armoury for self-attack and sabotage. Meanwhile I entered the deeply mistrustful, horribly cut-throat world of the Academic (dis)community, studying what I perceived to be fungal antagonism, surrounded by believers in the absolute truth of the Darwinian 'survival of the fittest', 'red in tooth and claw' message. What hope was there, you might ask, for me to survive in this 'dog-eat-dog' world? Not much, perhaps. But here I am, writing about it, now.

### **'Natural Enemies' - Are They Really What They Seem To Be?**

Given our human experience of conflict, it is not surprising that we can find so much evidence of self-versus-other confrontation when we look for it in nature. We may even go so far as to explain and justify the adversarial nature of human nature as no more and no less than a specific instance of the hostility and



competition characteristic of nature in general, accepting the Darwinian premise that life is a struggle for existence. We may find ourselves advocating fascist principles, caught up in vicious cycles or arguing inconsistently, if benevolently, like Richard Dawkins that we should 'try and *teach* generosity and altruism, because we are born selfish'.

As I explained at the outset, I was myself well primed to develop this 'Battleground' view of life when I began my own research enquiries. It wasn't long before my encounters with fungal territoriality had me happily declaring wars of fungal independence between conflicting genetic neighbourhoods, both of the same and different species. I saw fungal territoriality as no more and no less than a specific instance of the rejection and associated exclusion, elimination or subjugation of 'non-self' that is rife throughout the living world. A rejecting nature that manifests from molecular to ecosystem scales of organization and is expressed even in the sweet song of a Robin Redbreast warding off all comers.

But was this evident territoriality amongst non-human life forms truly an expression of enmity between one and the other of the kind that occurs between human neighbours and neighbourhoods? Something just didn't and doesn't feel right to me about viewing non-human territoriality in this way, although it took me a long while before I could articulate my doubts.

To begin with, it seems clear to me that non-human territoriality is primarily an expression of the availability of resources needed to *sustain* a particular life form. That is, it is an expression of the *dependency* of the local organism identity upon supplies from its non-local neighbourhood, rather than the *dominion* of the independent organism over its neighbourhood. The organism feeds from terrain that sustains its current and growing form, no more and no less, in much the same way that a river feeds from its catchment in direct relation to the flow of its streams. At the margins of this territory, neighbouring collecting domains may restrict further outward expansion - as along the ridges that mark the watersheds

of adjacent river basins. Hence, the territory sustains and is *attuned* with the activity of the identity that patrols its dynamic boundaries and expands or contracts as this activity waxes and wanes in dynamic balancing relationship with its neighbourhood. Correspondingly, the identity neither *claims* more than is required to sustain itself nor *spends* more than can be afforded to defend this claim.

In this way, non-human territoriality ensures a proportionate distribution of resources, 'to each according to need/demand', in which individual and collective consumption are dynamically balanced so that diverse local identities can co-exist side-by-side in a sustainable relationship. It thereby avoids what have become known in unsustainable human systems of economic and environmental management as the 'Tragedy of the Commons' and its counterpart, the 'Tragedy of the Anti-Commons'. The Tragedy of the Commons arises when individuals or their stock collectively over-consume a common resource in order each to procure a disproportionate competitive advantage over their neighbourhood. In other words, unimpeded individual competition in a common space creates an imbalance that leads to wasteland. The 'Tragedy of the Anti-Commons' arises when prescriptive enclosure of common ground leads to inequitable distribution to a privileged few associated with under-consumption of available resources and a growing gap between rich and poor.

So, what could be the origin of the imbalance between individual and collective consumption in unsustainable human gatherings? I think this imbalance may arise from our self-conscious tendency to regard territorial boundaries as fixed limits to dominion – ownership by a local controller of its non-local neighbourhood – rather than dynamic limitations to resource availability. Hence human territorial boundaries are rendered as places of alienation from rather than respect for those on the 'other side of the fence'. Human fences may thereby mark the carving up of neighbourhood into discrete segments, according to the power and *a priori* claims of owners, which is defended at all costs. They are then the

product of prescriptive imposition, rather than relational sharing between different neighbourhood identities. In other words, they are the product of objectification. Perhaps the 'competition' that we may be so ready to see in nature is, along with its *antithesis*, 'co-operation', a figment of our objectification, our capacity to create misleading impressions by drawing hard lines between one thing and another.

Perhaps what is really ongoing in nature, which we may vainly try to isolate ourselves from, is continual dynamic balancing of complex neighbourhood flow-form identities that are distinct and spatially pooled together, not discrete and spatially pulled apart. This dynamic balancing is correspondingly about the *differentiation* and *integration* of diverse neighbourhood identities in complex harmony with, not in *opposition* to, one another.

If so, just what have we been doing to ourselves through our mythological objectifications? Is human conflict 'itself' a figment of our objectification that becomes a self-fulfilling prophecy as we fight fear with fear in ever more desperate attempts to correct or propagate imbalance between neighbourhoods polarized by their ideological ways of seeing one another? Could we gain a more dynamically balancing orientation, through a more inclusional understanding of neighbourhood identity and its role in sustaining diverse populations and communities? I think we could. The question is, do you think we should? Should we celebrate our alienation from/of nature as the hallmark of civilization, security and freedom, or should we relax into the unpredictability of nature's ever-changing flow? Or perhaps, if we are to thrive and survive, we don't really have a choice - we only like to think that we do.

### ***Enemies of Human Consciousness - A Product of Objectification?***

No sooner do we put up fences, physically or metaphorically, to mark hard lines between the neighbourhoods of 'I and You', 'Us and Them', 'Here and There',

than we are set to create and reinforce the most fearfully powerful of all human objectifications. We reify the notion of a purely external objective 'other', which, depending on its actions towards us we may then interpret as 'friend' or 'foe', 'ally' or 'enemy', 'with us' or 'against us'. The interfaces between neighbourhoods cease to be places of dynamically balancing relationship, sustained by reciprocal communication in common space, and become instead battle lines, from which all common space has been excluded between *opposing* sides. The only commonality that now exists in our minds is confined to one side or another. It is the commonality of having or belonging to the same object, reinforced by opposition to some other object – a commonality of purpose or ideology. This commonality may be marked outwardly by some expression of conformity – a uniform of clothing, language and or practice that denotes a *being of the same mind*.

Once such absolute demarcations have become fixed in place, they become devilishly difficult to loosen or even to see for what they are. They become compulsive addictions held with extraordinary tenacity – fixations so deeply embedded in human self-consciousness as to appear as unquestionable facts of life. The scene is set for strife - an adversarial confrontation between alienated objects that either perpetuates endless painful, wasteful vicious cycles or ends in the elimination and consequent *loss* of one by the other. Either wasteland or unbalanced monopoly beckon. Fixed at the centre of these realms of desperation is a self-consciousness that declares itself to be an independent entity, pulled apart from other by space and boundaries rather than pooled together in space and differentiated by boundaries. A contextually dislocated executive centre of independent action, which can all too readily become its own or others' executioner - a position in which it may well find reason to be proud of itself!

***Entities and Identities: To Be and Not To Be - The Same Difference?***

The Tragic dislocated object figure of Hamlet enters the scene and ponders the great false dichotomy of human conflict. 'To be or not to be, that is the question: whether 'tis nobler in the mind to suffer the slings and arrows of outrageous fortune, or to take arms against a sea of troubles, and by opposing end them?'

Here, perhaps we can appreciate most starkly how the perception of 'one alone', a particle isolated from waves, induces human conflict and its imposition upon the natural world in the form of Darwinian supernatural selection. Either it is something or it is nothing. Either it exists or it does not. Either it survives in the midst of strife or it is annihilated.

Here, perhaps we can see how complex selfhood identified by and within neighbourhood as a dynamic inclusion of context, can be reduced through objectification to a discrete entity railing against its fate. In that reduction the identity loses the vitality that comes from its co-creative relationship of local within non-local. It becomes deadened to the world of its dynamic experience. Whether it is or is not becomes the same difference.

### ***War Zones and Hybrid Zones – the dynamic nature of compatibility and incompatibility***

As I have described, I was at first very attracted by the idea that the demarcation zones I observed between different fungal colonies corresponded with the division of life into discrete, genetically defined categories. It was almost like the answer to a prayer that desired life to be made easy and predictable. Through conflict, all was resolved into definite individual units under the influence of natural selection. Far from needing to be *resolved*, conflict itself was resolution - the means by which life sorted itself out and made the hard choices needed for evolutionary change. Difference implied definition, of that I was certain. Individuals could be resolved through their somatic incompatibility. Species could

be resolved through their sexual incompatibility and consequent 'reproductive isolation', in the time-honouring tradition of conventional evolutionary theory.

With this certainty, I was able to resolve - or thought I could resolve - all sorts of questions about the structure and dynamics of fungal populations and communities in their natural habitats. Indeed my resolute research enquiries did seem to reveal and clarify all sorts of fascinating aspects of fungal life styles, which had previously been obscured by the supposition that hyphal fusion between different colonies could cause many to merge into one. Amongst my findings was the clarification of the distinctive patterns and processes of decay in wood and the foraging patterns and underground connections of mycelial cord-forming fungi.

But, almost from the outset, my certainty about the division of life into discrete genetic categories within and between species was eroded, consciously or unconsciously by quite profound biological questions. Where could the genetic diversity come from that underpinned division into these categories? How could such divided life be creative, let alone procreative? How could diversity be sustained in a competitive world? What could Love have to do with such a selfishly exclusive nature? As I describe at some length in my book, 'Degrees of Freedom', I began to explore these questions across the full spectrum of biological form, using my researches on fungi in particular as a platform for more general interpretations.

It quickly became apparent that genetic difference could have two contrasting implications in meetings of one identity with another. Either it could lead to rejection and mutual or one-sided exclusion, or it could lead to acceptance and complementary partnership. Rejection was 'somatic', a response of the body as a discrete individual, maintaining its integrity by keeping itself to itself. Acceptance was 'sexual' where it occurred within a species and 'symbiotic' where it occurred between different species.

So far, so good, but it also quickly became apparent that the situation was more complex than I could account for by tidy, sharply defined alternatives between rejection and acceptance on the one hand and between somatic and sexual or symbiotic interactions on the other. Somewhere or other, complete definition would always break down, with both creative and degenerative implications. Sexual and somatic encounters couldn't be kept entirely separate, notwithstanding the development of sexual 'private parts', and there were obvious parallels between symbiotic and sexual encounters in terms of mechanisms and processes. Correspondingly, the anticipated infertile interface between supposedly reproductively isolated species could instead be a 'hybrid zone', rich in recreative possibility. Similarly the interface between two apparently somatically incompatible neighbours of the same species could be fertile ground for the emergence of novel forms and interchange and re-organization of genetic information. By the same token, as I have mentioned earlier, supposedly compatible 'matings' between neighbours could have profoundly one-sided, degenerative and muddled implications!

I began to draw comparisons between my observations of interactions in non-human organisms, with the possibilities for 'merger', 'takeover', degeneration and complexity in relationships between human couples and organizations. Creativity was latent in the most seemingly incompatible response, and degeneration or depredation possible even in the most seemingly mutually beneficial arrangements.

One of the earliest ideas to emerge in my mind about these possibilities was what I called 'override'. This was the notion that compatibility and incompatibility between genetically and/or physically distinct life forms are like two attractors held in finely balanced dynamic relationship with one another: depending on contextual situation, one or other of these attractors may 'override' the possibility of the other.

Years later, though I might question my use of language, I still think this wasn't a bad idea, although it never really caught on with many of my peers. Perhaps this was because, in the tradition of scientific fortune-telling, they desired genetically pre-determined, mechanistic answers to questions of the kind 'will it or won't it', 'can it or can't it', 'is it or isn't it', 'to be or not to be?' 'It all depends' was not such an answer, but for me it had the potential to explicate, coherently and consistently, an enormous variety of biological and human phenomena whereby distinctive bodies could be brought into complementary sexual or symbiotic correspondence (attunement) or repulsion, consumption and parasitism of one by the other. These phenomena included elaborate courtship rituals, the preference for sexual partners that are neither too similar nor too different, the carriage and miscarriage of mammalian foetuses, and the varied expression of susceptibility and resistance responses to parasites in host organisms.

But this understanding still begs the question of what, really, might be the fundamental nature of compatibility and incompatibility? Could there be a way in which we could envisage them as compatible complements of one another – distinct and vital expressions of a common underlying natural theme, rather than incompatible, irreconcilable opposites? From an inclusional perspective, I think there could be just such a way of viewing incompatibility as compatible with compatibility in the evolutionary shaping of flow-forms as distinct, complex neighbourhood identities, not discrete executive entities.

My first instinct in trying to understand the fundamental nature of compatibility and incompatibility was, in tune with the times, to seek a genetic cause. Indeed it was immediately clear, from my own work and others, that there was a role for genetic factors. What was less clear - and this to my mind remains the most fundamental conundrum of modern biology - was how to characterize this role. How may a sequence of DNA, through its translation into protein, shape or



contribute to the shaping of the dynamic structure and behaviour of life forms? In other words, how does genotype correspond with phenotype?

The more I think about the relationship between genotype and phenotype, the more it resembles the content-context relationship between an organism and its territory, which I reflected on at the outset of this chapter. Correspondingly, the more obvious it has become to me that this relationship cannot reasonably be regarded as one of the *dominion* of local content over non-local context. The life and role of genes is sustained through the life of bodies in which they are dynamic contextual inclusions. The notion that genes can in any way selfishly possess and have absolute control over bodies in which they are dependent inhabitants is a figment of objectification, which can only reinforce the potential for human conflict. Genes cannot and do not *define* life. The rich phenotypic diversity of organic life on Earth cannot be understood as originating 'all in the genes' as central controllers. On the other hand, the way the form and expression of genes both influences and is influenced by their dynamic neighbourhood is vital to this diversity.

To my mind, the roots of compatibility and incompatibility therefore lie deeper than the structure and the function of genes they embody. They lie in the fundamental nature of all form as flow form - the dynamic spatial inclusion of electromagnetic within gravitational fields.

So, where in natural flow-form can the roots of compatibility and incompatibility be found? I think some deep insights into this question can be gained quite simply, by playing with water. For example, try throwing pebbles in ones, twos or groups of three or more into a local pond and watching the ripples spread out to meet one another.

Early on in my fungal researches, I got the feeling that the patterns I saw emerging after inoculating Petri plates with fungi were analogous to those made

by throwing stones into a pond. This feeling was reinforced when, years later, I was able to view time-lapse film records of mycelia growing and interacting.

The margin of the colonies would surge out like a wave front. Quite often, rhythmically alternating, concentric ridges and troughs of aerial and submersed mycelium would develop. Upon meeting, a trough or a ridge might form at the interface of the colonies. Where the colonies were genetically identical, and the peaks and troughs correspondingly of equal frequency and amplitude, this initial interfacial distinction would often disappear as the aerial and submersed zones aligned and merged harmonically with one another. Where the colonies were not genetically identical, the interface between them would either persist and intensify as a mutual 'barrage' zone or be superseded by the emergence and spread, in one or both directions, of a new or 'secondary' mycelial phase. In sexually compatible interactions of basidiomycete fungi, the latter would generally be 'heterokaryotic', containing nuclei derived from both participating colonies.

Following these observations, I find it makes sense to view biological compatibility and incompatibility as an expression and example of the so-called 'constructive' and 'destructive' 'interference patterns' that emerge when wave fronts meet. Compatibility occurs when assertive/responsive (convex/ridge-forming) and inductive/receptive (concave/trough-forming) phases *exactly* coincide with or reciprocate one another in a synchronous, *resonant*, coupled relationship. That is, full compatibility is only possible when participant flow-forms are in, or are brought by a process of attunement into identical or harmonic relationship with one another. Incompatibility, occurs when the participants are out of phase with one another, such that the relative space-timing of their fluxes is at least to some degree non-aligned. The degree of non-alignment - i.e. the degree of 'freedom' or 'uncoupling' of one from the other - is infinitely variable, such that the likelihood of absolute mismatch is infinitesimally small. The relationship between compatibility and incompatibility is correspondingly

complex, as almost any honest human married couple will attest. It involves a dynamic interplay between differentiation and integration of self-identity, with the balance between one and the other liable to shift under the influence of innumerable contextual variables. Staying together in sustainable, co-creative partnership of one with the other therefore requires a remarkable dynamic balancing act. Yet the possibility for compatibility to emerge and be cultivated through dynamic attunement is present, even in the most seemingly incompatible initial meeting. By the same token, the possibility for incompatibility to develop and intensify through the non-alignment or non-reciprocation of one with the other, is present even in the most seemingly mutually supportive arrangement.

To accept or not to accept, that is the question: whether 'tis more sustainable for the self to yield to the neighbourhood beyond but included within internal reach, or to resist a sea of diversity, and so hold firm to prior identity? Yet in both remains the possibility of the other, dynamically balanced, sustaining and co-creating diversity in a complementary relationship.

### ***Security, Liberty and the Sustainability and Transformation of Life***

Perhaps, then, it is the idea of an absolute demarcation between compatibility and incompatibility, and their resultant misplacement out of context, that can lead not only to the tragedy of personal and interpersonal human conflict, but also to unsustainable relationships with other life and living space. By regarding incompatibility as *incompatible* with compatibility, we become enmeshed in struggles for individual and ideological/cultural autonomy that either conceal or actively deny our underlying interdependence and complementary diversity.

At the heart of this absolute demarcation and the resultant struggles for autonomy lies a fundamental incompatibility between two great human ideals, which paradoxically are often regarded as one and the same: liberty and security.

On the one hand we may desire a dynamic, creative life. On the other hand we may desire a secure existence.

The reality of a *fully* secure existence is that it requires the *imposition of closure*, an oppressive regime that stifles creativity and communication beyond fixed and sealed boundaries. The certainty of *surviving* independently, as a shut down structure in suspended animation, is gained at the expense of *thriving* interdependently in and as a world of fluid possibility. In this sense, the notion of 'survival of the fittest' makes nonsense, because survival implies *dormancy*. It epitomizes our human tendency, born no doubt in the misapprehension of death as the annihilation of 'self', to equate surviving with living and so to get hooked on any 'security blanket' that appears to keep us safely paralysed.

Meanwhile, the reality of a *fully* liberated existence is that it implies an absolutely open existence of utter uncertainty and formless incoherence - something many people fear as 'anarchy'. Paradoxically, the liberated individual becomes lost in a sea of non-conformity, a sea of troubles.

In nature, security and liberty are dynamically balanced in relation with the contextual situation, so that they complement one another and are never taken to the extreme of an either/or opposition. Electromagnetic informational boundaries stiffen and yield as the spatial context, of which they are a dynamic inclusion, transforms. Life forms stiffen, seal, redistribute, open up and fuse their bodily boundaries as resource supplies wax and wane, and so are able to *sustain* themselves and/or their offspring in dynamically balanced relationship with their ever-changing living space.

Meanwhile a human nature fixated on the paradoxical notion of security and liberty either as incompatible opposites or as one and the same, goes to war in pursuit or defence of one or the other. Conscious of an oppressive regime that confines us within bounds we fight for emancipation. Feeling threatened by

external vicissitudes, we fight for security. An oppressive regime, faced with a perceived threat to its security, stiffens its boundaries to maintain its autonomy. An oppressed identity, yearning for liberation, stiffens its resolve to puncture what holds it in thrall. Liberty and security go to war in one another's names, stiffening one another's resistance in a vicious, frictional, energy-dissipating cycle.

Caught in this phase-lock between the 'twin towers' of ideological security and liberty - through discounting the liberating influence of immaterial 'solvent space'—our lives become unsustainable. The towers become adversarial and absolute rather than complementary and relative in the attunement of life with dynamic situation. Just when it is apt for us to open up creative possibilities, our fear of annihilation may drive us to try to close them down (fix them) in order to secure the *status quo* on which we feel our life depends. Meanwhile, we may try to 'open up' just when it really isn't apt for us to do so, dissipating energy ever more rampantly and competitively as resource supplies in our neighbourhood run short. Darwinian self-preservation is unsustainable as a way of living and evolving. It has got us deeply and powerfully hooked into a conflict that seeks resolution through the elimination rather than complementation of difference. This is a conflict where stiffening resolution opposes and strengthens stiffening resolution in an escalating arms race. Here, there is no room allowed for complementary yielding, for giving and receiving in a reciprocal dynamic relationship that disarms because it dissolves the grounds for opposition. The solute defies the solvent and so can find no solution for the sea of troubles in which it feels itself awash.

### ***Vampiric Inversions - Of Tyranny and Terrorism***

Somewhere around the beginning of September 2001, I woke in the middle of the night believing that my skin was on fire. I had been dreaming that I was a passenger on an aircraft that had been taken over by hijackers and flown into

some vertical edifice. I saw a ball of flame advancing rapidly down the fuselage towards me. I had no choice but to allow myself to be consumed.

Unusually, I failed to make a note of my dream, and so have no 'proof' that it really occurred. I only recalled its intensity a fortnight or so later.

On or around 14 September, 2001, I woke up in the morning with the following whole piece (hole peace?) of writing reverberating around my mind, waiting for me to set it down. I didn't take me more than a few minutes to do so.

*Re-Uniting Self With Other – How the Hole in Our Hearts Can Heal*

*A Hole has appeared in downtown Manhattan. Enormous symbols of economic hubris have been fearfully punctured by sharp transgressions, collapsing in moments. We feel a hole in our hearts, filled with the pain of the crushings and burnings and exuded spirits of those moments. We cast around for explanations, a way forward out of the darkness, in which good can somehow prevail. For many, the way is to fall back on old ways – to cast blame elsewhere and seek to root out the evil. But it may be as well to look in the mirror.*

*We all, needs must, harbour anger, an inner thorniness that in its place protects and empowers, but out of place abuses and wounds. Tyranny's anger is roused by terror, a real or imagined thorn in its side that wounds and threatens its freedom to suppress. Terrorism's anger is roused by tyranny, a real or imagined domination that deprives and denies its freedom of expression. Neither can win, both can lose in a never-ending war of attrition. Both seek to exclude the other, to cast out its evil so God can prevail. But God, they say, moves in mysterious ways, both inside and outside our bodily selves.*

*So, maybe the way forward is to feel the hole in our hearts for what it is: the empty inner space, the Ground Zero, of a Love that includes Other as Self in*

*common passion, in spite of and because of the hurts it inflicts. We can do so in the spirit of an immersive philosophy that regards all things, our Selves included, as dynamic inclusions of our common living space. We are no more separable from this space and one another than are whirlpools in a water flow. No thing, no being, is isolated or independent from any other, but rather exists in a mutually transforming relationship of one with the other. Any thing we do to Other, we ultimately do to our Selves.*

*This 'inclusional' philosophy is not new, of course. It has always been present in our hearts, and at the heart of those cultures and religions that so sadly, so often, find themselves in conflict. But it is easy to lose sight of, particularly because it requires us to see something invisible that we can only imagine: the implicit space, the material absence, that, far from coming between us, actually unites ('intra-connects') our insides through our outsides. We breathe each other's air. And when we do lose sight of it, choosing to focus only on explicit material things through our rationalistic desire to gain social, political, economic, psychological, scientific or technological control, we separate the inseparable. And then, with all possibility of relationship denied, the scene is set for abuse.*

*So, when the abuse comes, and we feel the hole in our hearts, perhaps we should not view this as a call to arms for further abuse, but rather as an alarm call telling us to look in the mirror and wake up to the reality of our common existence. Then, maybe, the hole can begin to heal.*

At the time of writing this piece, I had no knowledge of the use of 'Ground Zero' to describe the scene of devastation. I hesitated to share it with more than a small circle of trusted friends, for fear of giving offence and inducing, in my own small way, even more hurt in a community filled with raw emotions. I wasn't sure of my own motivation, knowing just how desperately I long for a different way of

seeing to subsume the dominance of western rationalism. But meanwhile, the glimmering of hope that I had dared see emerging from the devastation was quickly occluded. The offended 'atmosphere' of the world community, led imperiously by the 'twin towers' of the political leadership of the 'United States' and 'Great Britain', declared War on the 'hurricane' that had formed in its midst. The self-destructive vicious circle I had anticipated nourished itself on the lives of ordinary people caught up in its objectification of evil. I found myself angrily writing the following lyric, and eventually painting the picture shown in Figure 18.

### **The War of the Pots and Kettles**

*Black you are  
And black you be  
What ever else  
You cannot be me*

*Whiter than white  
And purer than pure  
I know what's right  
That's my allure*

*But, how can you be  
So very sure  
About what you perceive  
As your allure?*

*So confident  
In the rule of law  
That you can flout it  
Whenever your bent*



*Is to be without it*

*You think you're so brave  
To call me depraved  
As you parade your virtue  
Symbolized by your statue  
Of liberty*

*An oxymoron  
A freedom you lost  
Because of its cost*

*You think economics  
Is ergonomics  
But your economics  
Is egonomics*

*A self-righteous assertion  
That leads to desertion  
Of your human nature  
In which we so long  
To belong*

*So, let's bury the hatchet  
There's no thing to match it  
A celebration of difference  
And no indifference*

*No grayness  
No blameness  
But a splash of colour*

*Of every hue  
Not black and blue*

*That's me and you*



**Figure 18.** 'The War of the Pots and Kettles' (Oil painting on canvas by Alan Rayner, 2004).

Where were these feelings that I was giving vent to coming from? As I reflect back on how I had watched the events of September 11<sup>th</sup> 2001 unfold from the safe, excluded observer perspective provided through the rectangular frame of

my television screen, I become aware of a very disturbing emotional response arising within myself. I recognize my capacity to be intolerant of intolerance, and hence to allow a vengeful cycle germinate in my own mind. I see how seething anger, combined with a distancing perspective, can blind me to others' and my own vulnerable humanity. For, despite my knowledge of all the suffering and grief behind the scenes, I have to admit that part of me was delighted and thrilled by the sight of those monumentally egotistic 'I am' constructions crossed through and brought down to Earth in the most dramatic and starkly beautiful way. Momentarily, as G.W. Bush would insist, I found myself 'with the terrorists'. The thought, 'serve them right' flashed through my mind. How could I feel so callous, even momentarily? The popularity of disaster movies that delight in the catastrophic implications of human folly, and of the saying 'pride comes before a fall', suggest that I am by no means alone. In the midst of vain efforts to impose control on nature and human nature is stirred the spirit of rebellion that will glorify in destruction rather than submit in weak-willed compliance. A counter-cultural spirit that opposes a sea of troubles, yet by opposing feeds it. Addictive tyranny and addictive terrorism feed each other as each strives to fight fear with fear. Life feeds death.

To put my feelings into context, I can tell you that when I awoke on the morning of September 11<sup>th</sup> 2001, I was not exactly well disposed towards the Republican administration of the United States and its leader. I was appalled that this administration had come to power on the back of a very dubious electoral process, yet still had the gall to insist that it had a 'democratic' mandate to do as it wished. I was disturbed by the killer-killing-killer hypocrisy of its leader's enthusiasm for capital punishment. I was upset by the way that this leader appeared to put money before people before planet in his disregard of the Kyoto agreement on the need to mitigate global climate change. On the day of his election, I had commented to my therapist that 'this is bad news for the planet'. In short, for me, G.W. Bush and his administration epitomized the Vampire Archetype. So how could I avoid feeling strange delight in those symbols of

vampiric power crashing down? Yet in that feeling, I could sense myself being sucked into reflecting back the very hypocrisy that I so despised. I needed to look in the mirror and contemplate the danger of a one-sided declaration of independence by the vampire within myself.

### ***The Twin Towers - Of Machines, People and the Abstraction of Bad from Good***

The more I have reflected on my experience of obsessive-compulsive disorder, the more I have seen myself caught up in an internal vicious cycle between two towering, incompatible, core beliefs. Each in their own way deny my humanity and capacity to give and receive love. That these towering beliefs have been the hard core of my internal battles for survival and liberation in much the same way that I have come to see them operating within and between human communities at large.

On the one hand I have been prone to envisaging myself at the base of a 'dark tower', irredeemably flawed. No matter how hard I might try to be good, my intrinsic badness will sooner or later prevail and bring about catastrophe for those in my neighbourhood, who I love, and damnation for myself. In this tower, I find myself strangely secure - at least my situation can't get any worse, I can't be disappointed, and I keep myself out of others' harm's way. But I am imprisoned, paralysed by my fear of harm and punishment. I continually seek reassurance of 'no harm done'. But I cannot accept such reassurance and will always find 'room for doubt'. By the same token, I cannot accept any acclamation or sense of achievement, for fear that such would bring the walls of my tower tumbling down into the Hell Hole that has always been waiting to receive their erring inhabitant.

To dwell in this dark tower is not a pleasant prospect, so I am more than a little inclined to seek salvation elsewhere, in a Heavenly light/white tower of

extraordinary virtue and creativity. In moments of apparently high achievement, acclamation and soaring imagination I have found myself carried up this tower on the back of euphoric waves, liberated at last from the confining darkness of my doubts and fears.

Yet no sooner do I feel myself liberated to this place of elevation from deepest inferiority to utmost superiority, than I find my prospect no more pleasant than before. My certainty of failure is replaced by the giddy insecurity of success, accompanied by a sense of obligation to 'do good' at all costs. There is no place in this obligation for any human frailty, either in myself or in others close to me. There is no excuse here for not being good enough. I must not allow myself to be contaminated or distracted by others' human needs or my own. I am intolerant and judgemental: the world and myself must be pure, or, if not, purified - there can be no room for doubt or misdemeanour. But doubts and misdemeanours there most certainly are, and they assail me like thunderbolts. I do my best to ignore or repair the holes they make in my self-protective skin, to suffer the slings and arrows of outrageous misfortune with no loss of face, but my efforts are unsustainable. The holes enlarge. I feel I'm an impostor. I begin to panic. The dark tower awaits my return.

I feel rather embarrassed as I describe this melodrama that acts itself out in my psyche. How could I possibly believe in such fairy tale extremes, such obvious impostors of Triumph and Disaster, Good and Evil, Pure White and Abject Black? And, of course, I don't. No, not *really*. Do I? But why, then, do they hold me in such thrall? And, by the looks of it, I am by no means alone in my fantastic dreams and nightmares. But was I born with them - or they were inculcated into me during my 'upbringing', through my parents and neighbourhood? Those visions of Darkness and Light at loggerheads abound everywhere in the history of human conflict. Time and again, it seems that we have forsaken our loving space by taking up the fundamental cause of one against other. Time and again,

we have fed Death with Life as we wage War against 'It', Our Objectifictional Enemy.

By abstracting space from matter, darkness from light, bad from good, negative from positive, it seems to me that many of us have created a supernatural false dichotomy between two bastions in whose crossfire countless generations have suffered grievously. All for the sake of a powerful delusion. Bad can only be Bad when It is abstracted from Good; when loving, receptive darkness is abstracted from living, responsive light, of which it is a dynamic inclusion. When darkness is given a bad name, all Hell breaks loose and Heaven fights an unsustainable rearguard action in a loveless, space-excluding world of paradoxical inversion.

In this loveless world, we boil down our flowing, receptive-responsive human nature to that of discrete performing objects, analogous to the machines that we manufacture for our own use. Our regard for self and other may then boil down to how 'good' or 'bad' we rate our individual performance. Since 'things' can only get better through a process of elimination of badness and selection of goodness, we become obsessed with making favourable or unfavourable comparisons.

'Success' and 'failure' become the objects of our hopes and fears. We seek objective criteria or 'benchmarks' against which we can measure our performance. We assume that this performance is dependent on some purely internal or genetic design feature for which we can claim sole rights to fame or accept sole responsibility for shame. The nature of contextual neighbourhood has no place in our evaluations. The twin towers draw us into their anti-cultural loop. As far as I can see, there is only one way out of this loop, epitomized by the romantic call of the 1960s to 'make love, not war'. But in a space-excluding world that assesses value only in terms of superficial structure and function, and fails to comprehend the deeper beauty of what lies behind the scenes, it may be difficult, as Prince Charles acknowledged upon his engagement to Princess Diana, to know 'what love is'.

## ***A Place For Anger?***

I feel that I have expressed a lot of anger in this chapter. Perhaps this is inescapable when contemplating human conflict. But all the while, I have been conscious of the very ambivalent attitude that has developed towards anger in modern culture. Only certain kinds of expressions of anger appear to be regarded as 'justified' and therefore 'tolerable'. Others are angrily regarded as 'intolerable'. But which is which? I have certainly on occasion found my own expressions of intolerance of intolerance regarded as intolerable and hence counter-productive in trying to communicate my feelings about a situation - for example when attempting to sustain my 'Life, Environment and People' course in the face of external intolerance. I have - I dare say like many others - had to learn to temper my temper, even under circumstances of extreme provocation. But in so doing, I have been all too aware of the Manic Street Preachers' refrain, 'if you tolerate this, your children will be next'. Is anger always counter-productive, at the root of human conflict? Or can it be expressed in such a way as to assuage conflict? Is there a natural, inclusional place for anger and its expression?

As by now you might expect me to say, I feel that as with all emotions the way we express and accept or reject anger is dependent on our perceptions of space and boundaries. Where our perceptions are rationalistic, we may feel angered by any sense of violation of what we take to be our human rights to freedom, security and ownership as prescribed by rules, regulations and codes of conduct. Our anger seeks to close down or eliminate the perpetrators of any such violation, ultimately by force. Such anger has no place in inclusionality, although the fear of badness that lies behind it may be understood and potentially transformed through an inclusional perspective.

Where our perceptions are inclusional, we may feel angered by any sense of violation of our natural human sensitivities, creativity and neighbourhood and

hence our capacity to live, love and be loved in dynamic relationship. Our anger seeks to open up or restore this capacity by disarming and dissolving whatever forms of prescriptive closure - as distinct from dynamic guide linings - may be put in its way. Of course, the difficulty in this is that any such efforts to disarm or dissolve are liable to be construed from a rationalistic perspective as a threat to security, which will lead to a redoubling of efforts to repel and remove 'opposition'. As I have discovered every so often to my painful cost, the abstracted solute may not take kindly to the approach of the solvent 'peacemaker' that seeks solution to the stony confrontation of human conflict. It seems that the solvent must approach with care, or maybe just stand by at the ready, lovingly inviting the solute to take a dip and ease its tension. Which takes some patience in the irritating heat of a deserted reality. But you can only lead a horse to water.... You never know, perhaps it will catch sight of its parched visage in the mirrored surface and *want* to drink!

Hmmm. Perhaps on the next occasion I find myself aridly confronted, I should offer a glass of water, or, in the good old British tradition, a cup of tea! Which reminds me of the painting shown in Figure 19, which I made in response to an invitation to give a talk about genetically modified crops to a meeting of the British Association for the Advancement of Science in 1998. Shortly before preparing this painting, I'd had a dream about snakes, fast and venomous with inflated bodies like gaboos, vipers, puff adders or rattlesnakes, but with brilliant, purplish colouring. I had the feeling of coming across these snakes by surprise, and that they were guarding something I was looking for in an arid or stony environment. Something green or flowering, with a spring-like freshness, a watery outburst. Something like the sea daffodils that grow in sandy places on the Mediterranean coast.





**Figure 19. 'Oashiss'** (Oil painting on board by Alan Rayner, 1998). *Painted to depict the vitality and unpredictability of the partnership between DNA and water, the informational traffic and the contextual waterways, of living systems. A riverine snake, with DNA markings, guards a water-hole in a desert of sand particles blown into waves. Pebbles at the edge of the water, modelled on the "stone cells" ("sclereids") that make pears gritty, are separate, yet interconnected via their cores. A goat skull and a fish out of water show the effect of exposure to dryness.*

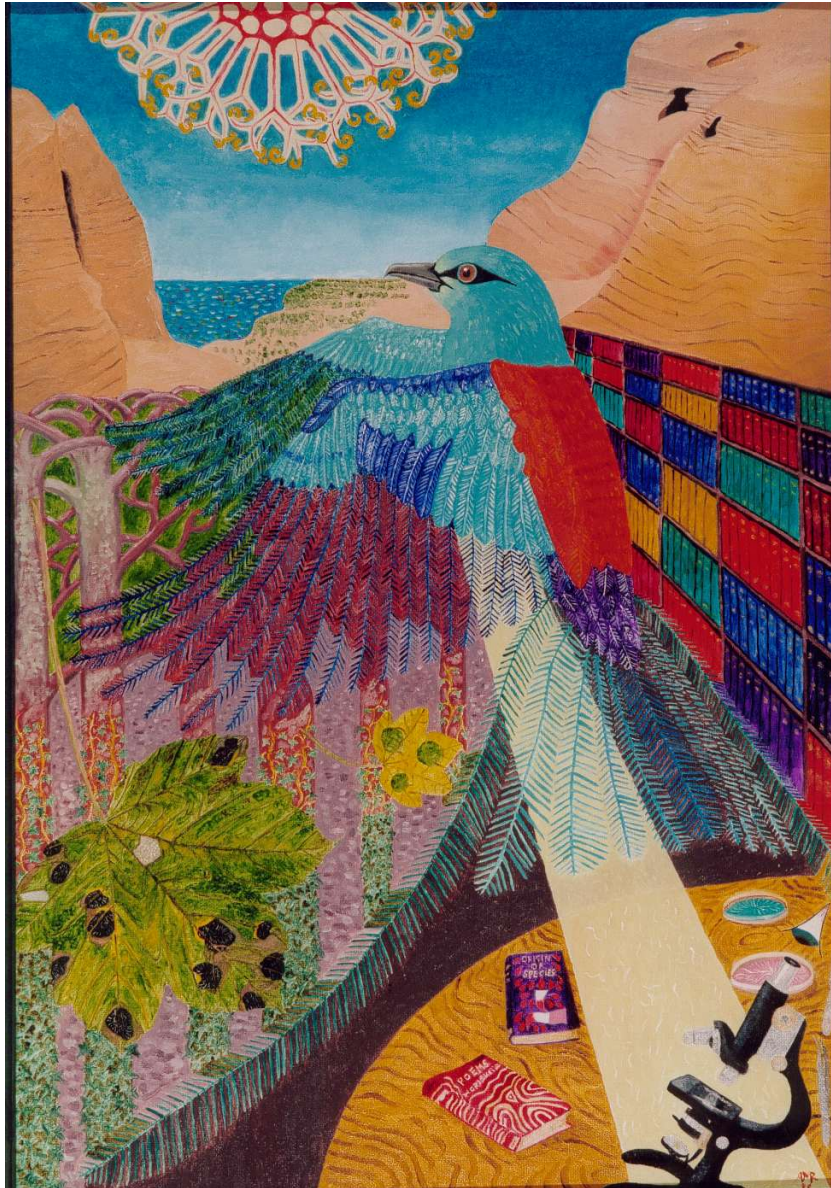
*How do we react to the snake? Do we attempt to control and predict its movements? Do we recoil from it? Do we relate ourselves to it? Which of these reactions promises most, or most threatens our quality of life?*

**A Place For Renaissance - The Flight of the Phoenix**

From the outset, I have declared my intention in writing this book that I might find, for my neighbourhood and/as myself, some place for hopeful creativity in the midst of the most resolutely incompatible human objectives. I have described the fearful crisis within myself from which this intention emerged at the same time that my fragile trust in my mycological, scientific and personal prowess finally collapsed.

In 1998, as I neared my crisis I had two dreams, which, in the context of this chapter, now seem very relevant. In the first of these dreams I receive a letter from a man working at Bathford Nurseries, near my home, who has read two of my papers, one about the importance of fungi in woodlands, the other about dynamic boundaries beyond the selfish gene. He wants to meet me so I go to visit his laboratory, in which he is culturing fungi, a situation that would normally alarm me. I feel surprisingly relaxed and sense the possibility of partnership with him. He strongly resembles the actor, Robert Powell, who once played the lead role in a TV series about the life of Christ. He takes me to a local woodland called 'Rocks East', a place where I have suffered panic attacks about the validity of my mycological work. I ask what to do next. Either he or the situation implies *do* nothing, just wait and observe. The woodland transforms into a library, full of dusty old books and speck-filled shafts of sunlight, another place where I would normally feel great apprehension. We hear bird cries, not unlike, but different from the cackle of a magpie. He points towards the sound and I see a bird flutter to the ground and then perch on a branch. It is a Blue Roller, a picture of which in a book once sparked my interest in natural history, but which I have never seen. The bird is incredibly acrobatic. I curse the fact that I don't have binoculars and so can't see it clearly. I feel exhilarated. My companion tells me it is actually one of a pair. We return to his laboratory. He asks why I am so excited - is the bird very rare? I say it is much rarer than a hoopoe. I catch sight of copies of my papers on my companion's desk. I woke feeling very emotional, as though freed to resume my personal and scientific interests in a more unassuming way,

uncontaminated by anger. Nevertheless I still felt very vulnerable and convalescent. A few months later, I painted the picture shown in Figure 20.



**Figure 20. 'Roller Coaster'** (Oil painting on board by Alan Rayner, 1998). A ferny-feathered blue roller, streaming upwards, transforms a dusty brown study of books and analytical devices, precisely but incoherently arrayed out of perspective of table-top context, past claustrophobic, tar-spotted sycamore

*woodland, into an eternal quest for belonging. Bookshelves become rock strata whose caves have protected ancient scrolls through ages riven by the pain of conflicting aspirations. A sun, the magnification of hidden powdery mildew fruit bodies on the underside of green-blotched leaves casts its beauty into the eye of the beholder.*

In the second dream, I put a candle onto a duck on the River Cam beside King's College, Cambridge. The duck swims away, but becomes a swan as its plumage catches fire. It joins another swan, which also catches fire. The swans swim serenely, but I fear for them and try to douse the flames with water. The swans scream and fly up a brick wall, against which they splatter as their hot grease spits and fizzles. I feel terrible.

I never did attempt a painting based on this dream, but on 7<sup>th</sup> September 2001, my daughter Hazel told me the joyful news of her engagement to her partner, Rijk. Hazel and Rijk love swans, and so an image came into my mind of a painting to celebrate their partnership. The painting is shown in Figure 21.





**Figure 21. 'Engagement'** (Oil painting on board by Alan Rayner, 2001). *Beyond a curtain of fire and containing wall of earthy bricks is a vista through air and across water to a bejewelled eternity, a curved, inductive, inner space within a ring, a loving Zero. The ring is shared between swans, male and female reflections brought together, each at One with the Other. Imagining beyond confrontation. Rejoining polarities. Denying Neither. Embodying Both.*

On 8<sup>th</sup> July 2002, at the wedding breakfast, I presented Rijk with a box of Swan Vesta matches.

### ***An Other Story - Unhooked Thinking?***

On 13<sup>th</sup> April 2005, I received an e mail message, 'out of the blue', from William Pryor. Another story began to unfold about how the logic of the excluded middle and its application in Darwinian views of evolution can get us, quite literally, into a fix. But this story also told how a creative re-appraisal of the nature of self could, through the inclusion of an immaterial dimension, bring about release from the vicious circle of human conflict that this fix sustains.

William had come to hear about me as the result of a visit to Clouds House, near Salisbury in Wiltshire, a centre for the treatment and rehabilitation of people suffering from drug and alcohol addiction. A few months previously, I had given a talk about inclusionality at Clouds, based around the prospect of 'creating with uncertainty'. William's visit followed upon a talk he had given about addiction as a catalyst for personal transformation. It was suggested that he and I should get to know one another.

It transpired that William is one of 32 great great grandsons of Charles Darwin. In the sixties and seventies he became addicted to heroin and other substances, under the influence of the beat writer, Alex Trocchi. He had been a contributor to a major event at the Royal Albert Hall and subsequent book entitled 'Wholly Communion' [my working title for this present book was 'Holey Communion']. In 2003, he published 'The Survival of the Coolest', a memoir of those counter-cultural times, which is being developed into a feature film.

So, here was I, a non-Darwinian evolutionary biologist meeting up with a direct descendent of Darwin who had been through the loop of addiction whilst I had

been through the loop of OCD (a condition which Darwin himself is thought to have experienced). As I read William's extraordinarily honest book, many familiar and some not so familiar scenes emerged. Both of us had had fathers at Cambridge University and ancestries that led to 'great expectations' of us to excel in whatever we did without trying. Both of us had the sense of somehow not being 'seen' for who we are, and being required to fit into some pre-prepared niche amongst the country's elite. Both of us felt oppressed. Both of us followed our father's footsteps into Cambridge, via schools we hated (Eton in William's case).

There, in some ways, the similarities ended, at least for a while. William's more adventurous spirit led him to rebel early - to experiment with and become addicted to drugs, thence to be sent down from Cambridge before he could complete his degree. He took on the role of societal scapegoat and black sheep of the family. My more fearful spirit and desire to please others before myself kept me confined within academia. I took on the role of societal goody-goody, only later falling into disrepute as my goat-like refusals to toe the line strengthened. Whereas William cycled between the twin towers of 'contented, drugged, secure highs' and 'discontent, needy, insecure lows', I cycled between 'desperate, paralysed, secure lows' and 'dangerous, liberated, insecure highs'. We were caught in reciprocal loops. We both needed a way out of our fixes that the other's experience might in some way offer. William needed to let go of insecurity. I needed to let go of security. We both needed to find a way of including immaterial presence in our lives. William found relief in meditation. I find relief in getting out of myself. We both looked for a philosophy that included immaterial presence. William developed what he called 'Unhooked Thinking' and the release from attachment to 'things'. I developed 'inclusionality' and the release from confinement by 'things'. In April 2006, our first, jointly organized 'unhooked thinking' conference took place in the Bath Assembly Rooms.

Perhaps unhooked thinking and inclusionality are one and the same, a means of liberation from the myth that we are independently driven individuals engaged in a loveless struggle for existence. Perhaps, most fundamentally they are about the love that gets left out when space is excluded from our objective definitions of nature and human nature. When love is included, conflict dissolves.



## **8. Return to Eden - Coming Back Together**

## ***Spatial Reconnection - From Disintegration to Reintegration***

So, it seems that by not abstracting space from matter and giving it a 'bad' name, an opportunity may emerge for human beings to *return to natural* in the process management of our lives.

This does not necessarily imply 'returning to nature' as some imagine it. It does not mean casting off the clothing of civilization and all its hard-won creature comforts and accumulated knowledge, in order to return to the profound hardship of yesteryear. What it does mean is a change in priorities. It means moving away from rationalistic attempts to impose definitive structure upon nature in an unsustainable effort to keep it within secure bounds and moving towards inclusional practices attuned with our dynamic neighbourhood. Hence it may be possible to curtail the ongoing fragmentation of humanity into discrete factions excommunicated both from one another and from our living space. Our neighbourhood organization may thereby be transformed into somewhere more like the diverse yet harmoniously self-orchestrating natural communities in which human life evolved, prior to the quest for knowledge as power.

## **Wheel Life - From Executive Centre to Reception Centre**

I suspect few people would deny that the wheel was humankind's most liberating invention. In my own intellectual meanders I have myself been accused of re-inventing it on numerous occasions, to which I always retort that without re-invention few ideas would ever catch on. I have also contrasted the wheel with the brick, as perhaps humankind's most confining invention. The brick, as a rectilinear construction, is a means by which we wall ourselves both physically and mentally in assembly line logic that denies the primacy of non-linear over linear geometry and so fixes reality in an immovable reference frame.

What then happens if we impose the confining security of rectilinear brickwork upon the liberating potential of the circular wheel - as when we impose stationary Euclidean 'flat space' upon natural dynamic curvature? In a word, we get *paradox*, along with much discomfort - the proverbial feeling of being a 'round peg' in a 'square hole' (or *vice versa*).

Henri Poincaré appreciated this discomfort in developing his theory of relativity when he asked his peers rhetorically 'does the Earth rotate?' Few it seems 'got' his point, not even Einstein. They thought he was challenging the Copernican view and advocating a return to the Ptolemaic proposition that the Earth is the fixed centre of the solar system and not the Sun. But actually, he wasn't. He was *deepening* the Copernican view by challenging the stationary framing of Euclidean geometry, in which there can be one, and only one, fixed centre of any system. In a Euclidean reference frame, *either* the Earth must be fixed whilst everywhere else rotates around it, *or* the Earth must rotate around some other fixed centre, such as the Sun and its own axis. The possibility of the Sun, Earth and other heavenly bodies all moving *relative* to and under one another's *simultaneous* mutual influence, like swirls in a river or people in a crowd is excluded. Moreover, calculating the dynamic relationships of these bodies is impossible using conventional mathematics. This is the 'three body problem', which Newton himself acknowledged in having to reduce it to apportioning the relative movements of just two bodies at a time.

Now, I want to consider what rotating about a fixed point or axis really implies. This is an important consideration, because it lies at the core of Euclidean geometry and the assumptions that are made in rationalistic logic regarding independent action, driving force and central control of the behaviour of any moving body as a discrete 'object'.

The pivotal question is this: can a fixed centre drive the behaviour of a body around itself? Assuming that it can has been the basis for all our rationalistic

ideas about the free will of individuals and their one-sided government by a central executive and/or external authority. These ideas lie behind all kinds of 'command and control' approaches to human management as well as everyday notions such as 'driving a car'. Yet, for all that it may disappoint my University Vice Chancellor and Head of Department, the answer to the question, inescapably, is no. Recall my discussion of the 'windmill' in an earlier chapter. We might have been clever enough to invent the wheel, but, by discounting space as 'nothing' we don't seem to have got wise to its radical implications. A *fixed* centre cannot *drive* anything, for to be fixed it must be *dislocated* from its dynamic neighbourhood. This requires that it either consists of pure immaterial space or is pure material surrounded by pure space. It cannot simultaneously be solidly connected with its dynamic neighbourhood *and* fixed in position.

Since real world local centres cannot both *act* and be *fixed* in place at the same time, they cannot be executive centres driving local object behaviour. Moreover, their position can only be inferred by reference to the configuration of the neighbourhood in which they are dynamically included and for which they provide *foci* through and around which energy is orchestrated - as at the 'eye' of a hurricane.

Correspondingly, no one can, for example, *drive* a car - the very idea is preposterous. They can only respond receptively to its dynamic situation and so *guide* it around the neighbourhood that supplies it with fuel and provides paths of least resistance for it to run along. Likewise, no one has the power to govern a people without the people's empowerment - they can only be receptacles through which the people's behaviour is orchestrated. Local cannot drive non-local. To assume that it can, through the possession of abstract knowledge, is the arrogance that drives One out of the contextual Garden of Earthly Delight to a singularly lonely and unsustainable life.

### ***From Forms of Doing to Forms of Receiving and Responding***

A fortnight into my 'stress leave' from Bath University in 1999, I had one of my more unusual dreams. At the opening of the dream I am Chairman of Bath University Estates Management Committee, or some such body, inspecting the campus grounds on a cold, grey, damp day in early spring. A young woman is driving a motorized lawn mower, cutting broad swathes through the damp grass near the lake. I think that the conditions for lawn mowing aren't perfect, but suppose it is necessary. I take over the machine and continue cutting the grass, but the mower gets stuck near the lake where there are some particularly thick stalks. I get down to inspect the stalks and realize that they are bamboo shoots and I will have to cut them manually. I cut them with a chopper, by which time they have grown into hazel tree trunks and I have to deliver several blows. There is a gathering of onlookers and I feel obliged to chop off their hands, which they offer to me without protestation. One of the onlookers is a former mycological research colleague, and I feel great reluctance to cut off his hand. I also fear for his and others' safety in view of the inevitable blood loss - how can I be sure that the flow will cease and the wounds heal over? Nonetheless I do the job and am awed by the ease with which I slice through the arm and the beauty of the cut surface, which reminds me of a ripe fruit. I worry that the loss of a hand will be crippling. But my colleague points out that in place of a hand there has grown a spoon, which will be very helpful.

When I had this dream, I felt that it concerned anxiety about my personal situation. I was giving up a position of expert authority in a field that I cherished, but was choking and frightening me, for a very uncertain future where I might find myself even more disabled. Somehow the dream was providing reassurance that my act of excision was necessary and likely to be fruitful in the longer run - however damaging and dangerous it appears in the short term.

As I review the dream now, I am more struck than ever by the fundamental transformation that takes place at its core: the exchange of the executioner's axe-wielding hand for a receptive spoon. In many ways this exchange symbolizes the transformation of rationalistic into inclusional understanding of the nature of neighbourhood as it becomes a place where an unsustainable executive self-agenda is *willingly* relinquished in order to allow a more receptive-responsive mode to grow. Through the wilful abandonment of belief in free-willed independent action driven by some executive centre of self, a more sustainable prospect is opened up. As my friend, Ted Lumley, might comment, 'the wild goose in letting go of its individual action agenda in the common space of others, flies further, faster and with less expenditure of effort'.

### ***The Transformation of Newton's Third Law - From the Dog Chasing Its Tail to the Worm Ouroboros***

Implicit in this shift beyond the one-sided concept of 'independent action' into the reciprocal couple of 'reception and response' is a fundamental transformation of Newton's Third Law of Motion. The rationalistic, space-excluding, time-framed, adversarial notion that 'action and reaction (of independent material bodies) are equal and opposite' is transformed into the inclusional, complementary understanding that 'reception and response (of interdependent neighbourhood) are equal, simultaneous and reciprocal'. As I will try to show below, this fundamental transformation opens the way for a more compassionate view of nature and human nature. This view is based on 'common passion', empathic regard for the vulnerability and promise of one another's unique receptive-responsive situation in common space, not paternalistic sympathy for the plight of another less well off than oneself. In recognizing that all forms of explicit 'action' are implicitly forms of local response to non-local reception, it transforms the life-management question that we ask ourselves from 'what do I *do* about this?' to 'how may I respond receptively in this situation?'

Some imagery may help understand what is entailed in this transformation from objective to inclusional perception. How many of us have laughed ourselves silly at the sight of a dog chasing its tail? Yet how many of us have paused to reflect on how our predatory binocular vision may lead us similarly to pursue elusive, illusory objects that appear to be detached from ourselves, but with which we are actually dynamically pooled together as dynamic inclusions of space? How many of us, feeling the pain and fear of our space-excluding, time-framed detachment from nature as self-contained individuals, have got caught in vicious and addictive cycles of human conflict where we respond to detachment with detachment in our loveless quest for liberty and security? How many of us in telling tales about an objective world 'out there', beyond our skin, are seeing only the tail ends of the story of our complex dynamic neighbourhood?

If it would only reflectively rest its dogmatic paws for a while, the active-reactive creature chasing its tail is not so very far away from the symbol of the Worm, Ouroboros, the serpent that takes its tail in its mouth. On the one hand, this serpent could be seen to represent the self-consuming consequence of the one-sided failure to recognise polarized other as an aspect of self - a symbol of the Vampire Archetype. On the other hand, like a child sucking its thumb, it can be appreciated as a symbol of profound inclusionality, the loving, open-ended, simultaneous reception and response of one spatial scale within another spatial scale through their common bodily lining. The spatially agape (lovingly receptive) mouth invites (makes possible) the intrusion of the tail as a local aspect of itself, which is distinguished by the convexity of its dynamic boundary. The tail is fed through the mouth in more ways than one. I suppose it was this sense of bodily inclusion that my father felt obliged to put a stop to by painting bitter aloes onto my opposable thumb, so that I would take it out of my mouth. I could then put it to executive use as a tool-wielding action man, cut adrift into the world.

## ***From Hard Core to Open Heart - Compassion in Place of Strife?***

I must say that I have never felt good about the action-followed-by-reaction, 'eye for an eye', idea of 'punishment' either when on the receiving end or, sad to say, when I have found myself meting it out. As Mohandas Gandhi reputedly said, 'eye for an eye makes the whole world blind'; grievance compounds grief. There is something truly inciteful, not insightful about being labelled or labelling another as 'bad' and being made to suffer or being prepared to inflict suffering as a consequence. It is an imposition whereby perceived abuse is reacted to with further abuse, delivered from a self-righteous standpoint. What can be 'right' about the deliberate imposition of pain upon a vulnerable, receptive-responsive fellow creature, regardless of that creature's behaviour or its dynamic context? I feel that such imposition, as distinct from a protective or restraining response, demeans the humanity of actor and reactor alike. It arises from a unilateral declaration of independence of reactor from actor in an anti-cultural theatre of abuse, which is liable only to incite further abuse at compound interest. It is a product of fearful objectification, which precludes the possibility of love. Correspondingly, the desire to inflict punishment in one way or another lies at the assumed executive hard core centre of all human vicious cycles.

'Ah', I hear someone say, 'but aren't *you* being hypocritical in portraying punishment as "bad"?' 'No', I am obliged to respond to forestall this potentially never-ending word game. 'I haven't labelled anything as "bad", because I have not accepted the notion that any "thing" can exist in independent isolation. I have merely described how punitive attitudes can arise through the abstraction of "bad" from "good", and most fundamentally through the mental (it can't be achieved physically) exclusion of space from matter, which leads to a belief in independent, internally driven "things". I have described what kinds of behaviour can emerge from such a belief, and how these behaviours can be perceived as abusive and obstructive to loving relationship. This is not to say that these



behaviours are 'bad' in the sense of emerging from some kind of fundamental ill intent or universal 'evil.'

'Badness' is, correspondingly, no more than a mental and social construction, which we impose upon nature and human nature, but has no place in nature. So powerful is this construction, however, that it can lead us literally to 'do terrible things' to one another in the name of what some of us may fundamentally believe to be 'Good', 'God' or 'good for ourselves'. These 'things', perceived as they usually are as independent, executive-centre based 'actions', fly in the face of our potential to live fluidly together in loving and respectful, sustainable, dynamic neighbourhood.

As far as I, in common with many others can see, there is only one way around this self-fulfilling objectification of badness, and that is to find a place in our hearts for unconditional love. Unconditional love is the source of truly empathic compassion, which arises from a receptive-responsive understanding of neighbourhood as self. It is not, to my mind, the paternalistic charity offered to those who are not as good or as well off as oneself, which is increasingly being espoused by conservative politicians. Nor is it the acceptance of 'anything goes', implied by the philosophy of moral relativism. It is the common energy of feeling pooled together in and by immaterial space. To experience this feeling, it is necessary to let go of any desire for absolute security or liberty that might seem to accrue through the imposition of fixed boundaries defining 'good' or 'bad'. Thence it becomes possible to respond receptively to the receptive responsiveness of one with another as distinct, but not discrete identities. To work both individually and collectively in ways that sustain the creative potential of one's neighbourhood, relaxing and stiffening its dynamic boundaries as appropriate to situation. With space in our hearts to include other as us.

***Host Space – The Life and Soul of the Party and Its Dynamic Management***

I want now to begin to explore how the process management of human and non-human organization is affected by the transformation from executive to receptive-responsive perceptions of natural dynamic geometry. It seems apt to commence this exploration from the perspectives provided by my work on the ecological and evolutionary relationships of trees and fungi. For it is from these roots that I have come to think that they epitomize the problem at our roots - our way of seeing the world and our human place in it. What does human 'well being' really mean, and how does it relate to the way we relate with nature?

Since fungi are so often regarded as 'rotters' and 'parasites', I am immediately drawn to the question of what the notions of 'health' and 'disease' really mean. What is a healthy tree? What is a healthy anything?

Shortly before his death, Louis Pasteur, held by many to be the proud father of the 'germ theory' of disease causation, is said to have confided to his friend, Dr Renon, that '*Bernard avait raison; le microbe n'est rien, c'est le terrain qui est tout*'. ['Bernard was right; the microbe is nothing, it is the terrain that is all']. This remark alluded to the insights of Claude Bernard, whose applicability was demonstrated by Pasteur's historically neglected rival, Antoine Béchamp, concerning the fundamental importance of individual situation in determining susceptibility to disease. Nonetheless, the notion that a microorganism can be regarded in its own right as a causal agent of disease - a 'pathogen' - continues to hold sway in many researchers and practitioners.

Suppose you see a fungus fruiting on a dead or dying part of a tree. How do you interpret this situation? It is only too easy to conclude from making the kinds of one-sided definitive assumptions characteristic of germ theory (and certain Heads of State I can think of) that the fungus is attacking the tree from outside - an alien invader. From here it is a small step to leaping to the defence of the tree,

and wanting to *do* something to stop or indeed *eliminate* the fungus, especially if you have some vested interest in the tree.

A moment's inclusional reflection will, however, inform you that there could be many, varied and complex explanations for this situation. To begin with, the tree might be dead or dying because of the presence of the fungus. Or the fungus might be present because the tree is dead or dying for some other reason. You might try to use the definitive set of rules and methodology known as 'Koch's postulates', to discriminate between these alternatives. But then what if the dying of the tree and the activities of the fungus somehow augment each other? Then again, is the death or dying of the tree necessarily a 'bad' thing? Is it an aspect of the natural redistributive processes that are vital to the life of trees (and fungi) both individually and collectively? Is it the result of some externally induced stress or damage, perhaps associated with human intervention?

Clearly, any misreading of the situation is liable to engender inappropriate practice that 'does more harm than good'. The 'art' of inclusional scientific practice therefore lies in learning how to read the situation in an imaginative yet realistic way, which is open to possibility, through understanding how and why 'context is all', *le terrain est tout*. Context, in this inclusional sense, is not simply external 'surroundings' or 'environment', as in reductionism, nor is it 'everything merged into *one*', as in (w)holism. Context, in an inclusional sense is *everywhere*, a heterogeneous, dynamic energy-space or *neighbourhood*. We can visualize this neighbourhood as having distinct but inseparable local inner, non-local outer and intermediary domains: *a holey communion*. And so it is with trees and their inhabitants and 'exhabitants'.

I described in an earlier chapter how our scientific investigations of trees have revealed them not to be the solid blots of wood on the landscape that we might imagine them to be from the perspective of our unaided eyesight and tactile senses. Correspondingly, I discussed how, in terms of its contextual relationships

with other organisms, a tree could be regarded as a host space - effectively a receptive-responsive 'hospitality suite' inviting all comers to find shelter and sustenance.

How does it feel to think of a tree in this way? How might it influence your manner of relating with or 'managing' the tree? Do you one-sidedly impose yourself on it? Do you seek partnership with it, loving and respecting what it has to offer and perhaps offering something in return? How do you view the trees 'other' inhabitants? Do you see them as exploiters or partners? How might their pattern of behaviour be influenced or transformed by local circumstances?

Anyone who has thrown a party in their home will be aware of the rich creative and destructive potentialities of the situation! To close off these potentialities completely is to endure an isolated, dormant existence - no real 'life' at all. To open up these potentialities brings great promise, but also risk of damage to internal structure and function. The latter can, however, be minimized by mechanisms of 'damage limitation' that protect, repair and seal off vital partitions and sustain function, keeping the activities of guests within fluid bounds, perhaps aided by the guests themselves. Should these mechanisms fail, for example through inadequate resource supply or infrastructure, the system may be overwhelmed and lose viability.

That anyone should want to become a host, to throw a party, is an expression of our recognition of the importance of neighbourhood. An acknowledgement that our complex self-identity simultaneously has interdependent, reciprocally related, individual and collective aspects due to our inclusion in common space. Given this interdependence, neither entirely 'selfish' (neighbourhood-denying), nor 'altruistic' (individual self-denying) behaviour is evolutionarily sustainable. Our viability depends on relating our inner world with our outer world in a continual process of *attunement*, simultaneous neighbourly reception and response, as appropriate to circumstances.

Correspondingly, we can envisage a tree as a host space, which is simultaneously a dynamic inclusion of the host space of the forest, which is a dynamic inclusion of the host space of the world, which is a dynamic inclusion of the host space of the universe. It is quite some place for a party! Add to that that the guests in this host space are themselves host spaces and there is scope for an immensely rich multiculture of relationships to form, which depend critically on circumstances. In this dynamic context we can begin to understand the extraordinary variety of life forms that find accommodation within and without the tree's dynamic boundaries as it grows, dies and decays - the endophytes, heart-rotters, root-killers, mycorrhizal formers, sap-suckers, leaf-curlers etc. We also begin to recognize the complex ways in which the guests may influence one another's activities and in turn both influence and be influenced by internal and external environmental circumstances. This is no place to make snap judgements as to who is doing what and why - to allocate absolute responsibility in the guise of guilt, shame, blame and blessing. 'All is steered through all', as Heraclitus, is said to have said, as the basis for natural understanding that is the fount of all wisdom.

So the question is, how do our life management practices relate to these neighbourly processes of attunement? Do they take these processes into account, or do they deliberately or inadvertently ignore them?

Imagine approaching a tree as though it is an isolated system, *dislocated from its neighbourhood*. How is this approach likely to affect your way of relating to it?

I suggest that such an approach will inevitably lead us to view the tree purely as though it is a mechanical object, whose performance we wish to maximize against benchmark prescriptive standards or norms of productivity, dependability and perhaps aesthetic appeal. Rather like the way we are inclined to assess and manage other human beings and want to 'improve' or 'get rid' of them!

But in trying to maximize performance in terms of objective criteria, what aspects of the tree's natural, relational life of inner-outer attunement are we likely to overlook and even damage in the long run? Here are just a few thoughts for the more technically minded.

1. To promote productivity, we may add fertilizer or select fast-growing varieties. But in so doing we may inadvertently in the long run inhibit formation of mycorrhizas and promote the development of uniform stands of trees that literally 'overshoot' the capacity of their neighbourhood to sustain them and so become vulnerable to damage and infection leading to their early demise.
2. Alternatively we may add mycorrhizal inoculum. But in so doing we may inadvertently lessen the diversity and efficacy of natural mycorrhizal communities, with potentially damaging consequences in the long run.
3. By trying to eliminate fungi and decay, which we think are a source of danger, we may inadvertently remove vital accessories to the tree's dynamic function and damage the tree's protective boundaries.
4. Similarly, by attempting to prune the tree ourselves, rather than allow natural pruning to take its course, we may damage the tree's protective boundaries.
5. By tidying up fallen debris we may be removing a valuable resource.

6. By removing a tree's dynamic neighbourhood through thinning and clearance we may radically alter the conditions that it has grown up in - exposing it to the equivalent of 'culture shock'.

Imagine approaching a tree as though you were attending a party within its host space and neighbourhood. What kind of attitude might you adopt? Would you wish to be a gatecrasher, imposing yourself on its hospitality and making judgemental comments about the other guests? Would you seek to understand your situation and reciprocate the needs and offerings of your host, so you could both feel at ease? Herein lies, I think, the fundamental difference between rationalistic and inclusional approaches to management and perceptions of perfection and imperfection - 'health' and 'disease'. So, what might an 'inclusional' approach to tree management involve? I have just two general suggestions.

(1). Being alive to any tree's unique situation, its place in the ecosystem, the way it attunes with its neighbourhood, the complex relationships that such attunement entails and the ease with which these relationships can be destroyed by insensitive intervention. Correspondingly, thinking of a beautiful, healthy tree as one that is 'in place', attuned with its circumstances as a local or individual expression of its larger ecosystem context, by contrast with a 'dis-eased' tree as one that is 'dis-placed' from its natural relationship with its neighbourhood. More often than not, in this context, it may be the intervention of human beings that is the true pathogen, blundering in like inept 'party poopers' and so creating the contextual conditions of imbalance that destabilize the complex, heterogeneous, inclusional system of the forest. Much of the 'remedial' work that we find ourselves doing to enhance the health and alleviate the disease of the trees we care for may actually therefore be to remedy the repercussions of our own actions.

(2). Valuing one's own learning experience, being prepared to share this with others and valuing others' unique experience, rather than simply following or desiring some 'one size fits all' doctrine, fad or short term 'fix'. Being more of a 'chef', following guidelines founded on basic understanding of dynamic process, than a 'cook' adhering strictly to recipe book instructions.

I have the feeling that these suggestions might sound rather obvious and lacking any absolute, clear, fixed, authoritative direction. They might seem like not much more than we might gather about life's patterns and uncertainties from our everyday experience as relational human beings - good *neighbours* using *all* our sentient faculties. I do hope so!

### ***Natural Neighbourhood - Community in Diversity?***

With the unconditional acceptance of the place that others can and do have in our lives, comes a wealth of creative possibilities. Far from regarding these others as threats to our security and liberty, their complementary relationships can be seen as the intercommunicating dynamic roots of the 'all kinds that make a world'. Instead of seeking ways of living together based on an unsustainable 'consensus of conformity' - converging on the same view through a process of elimination of difference - the challenge lies in understanding how diverse views can be creatively combined to make evolutionary sense.

This is where I have always felt that biological science could make a most profound contribution to human understanding. Abundant evidence of how diverse forms and functions are combined in complex receptive-responsive dynamic organizations, from single cells to tropical forests, can be found everywhere in biological systems. Everywhere too, can be found evidence of how the imposition of uniformity upon these systems leads to degeneration. Sadly, the



lessons we could draw from biology seem not to have been learned. Moreover, these lessons will continue to be obscured as long as our biological interpretations of living systems remain rooted in attachment to a hard core belief in the unsustainable, paradoxical logic of the excluded middle. Like those figures in Figure 1, we will continue to be denied access to the Garden of Earthly Delight by our own imposition of fixed boundaries. We will remain locked in Arid Confrontation.

### ***Arthurian Leadership - A Re-connecting Role for Education?***

But it doesn't have to be like that. If we allow ourselves out of the trap of unremitting objectivity – complete with associated rules, regulations and policing – for a moment's reflection, isn't it obvious that our subjective and objective, inside-out and outside-in views are complementary rather than contradictory? Can't we see that each informs the other and that neither can be realistic in themselves? Do we not understand the significance of the fact that the interference pattern produced by bringing an 'object's' reflection from its inner space into relation with light from its outer space produces a hologram, with all relief and space retained, rather than a flat-field view?

I think that we can help bring our unique subjective views into rich, holographic rapport with our detached objective view, with each respecting and empowering the other, by developing an 'inclusional' approach to education in general and biological education in particular.

As I have tried to convey, inclusionality radically affects the way we interpret all kinds of creative, evolutionary processes. Boundaries that from a rationalistic perspective are regarded as discrete, fixed limits – places of 'severance' of 'one' from 'other', are seen inclusionally as 'dynamic fulcra', dynamic, non-Euclidean turning places. Here, mutual transformation and correspondence are possible -

as at the banks of a river where catchment and stream are brought into co-creative dialogue.

In appreciating the dynamic inseparability of 'content' and 'context', inclusionality may provide valuable insights into the origins and obviation of many kinds of conflicts and paradoxes arising from detached, rationalistic thought. If allowed to remain, these conflicts and paradoxes are capable of giving rise to serious misunderstanding of complex system dynamics and, consequently, to severe social, psychological and environmental abuse and damage. Their obviation will be a source of great relief, literally a 'breathing space', for *Humankind*.

So ,how, then, can we develop a more inclusional approach to education? I think an answer to this question lies in the new perspectives of dynamic geometry that inclusionality provides. Inclusionality calls for a radical re-orientation in our perspectives of space, centres and boundaries. It challenges the abstraction, implicit in the 'Enlightenment' rationalism of Bacon and Descartes and enshrined in the 'clockwork universe' of Newtonian mechanics, of 'things' as discrete 'bodies' whose kinetic movements are isolated from and independent of the transforming shape of their containing space. Instead, it envisages all universal features to be flow-forms, dynamic embodiments of the space that they both include and are included within. It does not treat space as a passive 'absence', a 'disembodied space' split apart from time and incapable of interacting with explicit matter and energy. Instead it envisages space as an inductive, receptive, super-conductive (non-resistive), inseparable presence, forever transforming and drawing in upon itself as a powerful attractor. Correspondingly, it treats boundaries not as fixed presences that render things discrete, or complete non-presences that wholly unify 'one' and 'other', but as dynamic, necessarily incomplete, transcendent surfaces, dynamic fulcra, that simultaneously both differentiate and integrate and so mediate the reciprocal relationship between 'inner' and 'outer'.

Boundaries, then, are viewed as co-creative, co-products of inner and outer space, that render these spaces 'distinct' ('identifiable') *but not* 'discrete' because the spaces are continuous through their boundaries. Boundaries both mediate the dynamic balance (zero condition) and infinity of inner and outer whilst being neither *entirely* one nor the other. They *inform* the space they both include and are included by. Information is found therefore not in solid particulate bodies surrounded by space, but rather in communicative relational interfaces that mediate *dialogue* over multiple, nested scales.

This inclusional perspective therefore brings views from inside-out into correspondence with views from outside in to create an image of reality that retains all its complex, dynamic, topological form of relief and space. All views of this image are unique. It is both holographic and dynamic (i.e. 'holodynamic'). Dennis Gabor, the *Nobel* Prize-winning inventor of holography, based his invention on an information theory that brings many, diverse, uniquely positioned perspectives to focus on a common space. And Gabor had a *Noble* predecessor, who exemplified a style of inclusional leadership, which I feel has a vital place not only in governance, but in the educational process that leads to governance.

The style of leadership I am speaking of is that of the legendary King Arthur and the elders of other indigenous cultural traditions. It is based on a natural departure from authoritarian instruction involving precise transmission of expert knowledge, to creating a space for dialogue within 'Round Tables' or 'Sharing Circles'. These non-linear forms are dynamically organized so as to bring together, respect and learn from diverse contextual perspectives. Here, it is accepted that people are uniquely situated within 'the opportunity landscape' and that none can have a comprehensive view of reality. The comprehensive, all round view, can hence only be formed through the relational sharing of individuals within the collective, as expressed in Figure 22.



**Figure 22. 'Honeysuckle Sharing Circle'** (Oil painting on canvas by Alan Rayner, 2003). *The painting is centred around a candelabra of honeysuckle blooms. Each bloom is unique in its own sweet way and at a different stage of development - some unopened, some freshly bursting, others yellowing. The blooms face outwards in a representation of combined receptivity and responsiveness towards an inward facing fringe of other flowers, interleaved with grasses: white rockrose; red campion; orange hawkweed; yellow-wort; green hellebore; bluebell; a mystery plant (actually an artistically licensed version of woad, original source of indigotine); violet. The stalk of the honeysuckle winds spirally outwards and then back inwards and downwards to its self origin, creating a pool of reflection, black in the middle and transforming through shades*

*of blue to silver around its outside. When no thing comes between, then no thing pools together a diversity of inner self with outer self-domains, waving correspondence through complementary relationship of one with another, embodying light with shadow across the spectrum of possibilities in common space.*

So in calling for us to 're-humanize education', this is the approach whereby I think we can develop a truly participatory learning style. It is what I have tried to develop in my 'Life, Environment and People' course at the University of Bath. I can tell you that the relief I have felt in not having to be an omniscient authority with Atlas-like responsibility, and the joy I have perceived in the students as they are liberated to develop and express their own interdependent views, is *immeasurable*.

## **9. Outward Bound – Emerging Vistas**

## ***Leaving Home - Exploration and Exploitation***

I was born of a colonial power that settled itself in East Africa. When my family returned hurriedly to England in 1958, my birth certificate was one of many items that got lost in the confusion. The upshot was that in the absence of a passport to legitimate my origins, I did not venture beyond the British Isles again until 1985. After years trying to trace the proof of my existence I was eventually told by the Kenyan authorities that they could not find the certificate, but perhaps if I could let them have a note of its reference number they might know where to look. My mother had to swear a legal affidavit concerning the circumstances of my birth, before I was given leave to set foot on a plane that carried me to Sweden, my first adult venture abroad. Within a few years I added Japan, North America and many parts of continental Europe to my itinerary. As yet, I have not returned to Africa.

Meanwhile, I eagerly adopted Britain as my spiritual home and set about knowing its natural history as intimately as I possibly could. I came to regard Britain as my natural neighbourhood, the base for all my worldly views. By the age of eight I had already had enough of travelling, with all its attendant anxieties, unfamiliarity and discomforts. I wondered at the desire of those around me to get abroad at every opportunity - a desire that now seems to verge on obsession in this age of cheap, atmospherically polluting, fossil fuel depleting air travel to anywhere and everywhere. What on Earth could be inducing this lemming-like urge to get away from it all at all costs? Isn't there already a super-abundance of life experience to be found closer to home? How could trips abroad be meaningful outside the context of a deep understanding of what lies closer to hand?

As my natural neighbourhood historical knowledge grew, however, I began to have doubts that were troubling, especially given my supposedly world-wise expertise and understanding as a biological researcher and educator. How on

Earth could I really expect to *know* anything about life beyond the British Isles, let alone understand it, if I hadn't experienced it first-hand?

It was in this spirit that the travels, not to mention travails, of my later life began. It is in the same spirit that my forays beyond my home base of mycology and biology, described in this book, have taken place. I have the feeling that my own learning experiences from my outward-bound forays have been enriched by my local neighbourhood experience in a way that would not have been possible had I not immersed myself in this experience first. I'd like to think that this experience has also been a source of enrichment for people I have encountered abroad.

It is in the contrasts and commonalities to be found between local and beyond - in the discovery of unfamiliar and rediscovery of familiar - that I think deep insights can be gained. For example, I have drawn much pleasure from discovering, for myself, the extraordinarily familiar patterns of life exhibited by very different species of organisms in very different geographical locations. I have found a similar pleasure during my transdisciplinary forays, in encountering the same basic philosophical issues cropping up again and again in very different guises in fields that most people seem to believe have nothing to do with one another.

This has led me to think that ecology, in the sense of the dynamic contextual study of pattern, process and relationship, is the most basic form of philosophical enquiry possible. It is applicable to all scales of physical organization and correspondingly to all fields of human endeavour. It is the root and route of what my friend, Jack Whitehead, calls 'living theory' - an educational philosophy that evolves in the process of its application to our individual and collective lives. Which is why in turn I have written this book in the way that I have - using diverse forms and styles of expression and ranging in viewpoint from subjective to objective, and in scope from subatomic to universal, whilst continually referring back to my biological home ground. But what, you might ask, *is* my biological



home? For, though my anxieties have made me desire it, I have, by no means lived an entirely settled life. As T.S. Eliot put it in 'Little Gidding': 'We shall not cease from exploration, and the end of all our exploring will be to arrive where we started and know the place for the first time'. Such is the way of wheels. In this way I have much in common with many other flow-forms of life, which intersperse phases of migration and/or exploration with phases of settlement sustained by their local neighbourhood. This sense of inclusional communion of local within non-local, is reflected in the patterns of migration and settlement of all life forms, including myself, as celebrated in Figure 23.



**Figure 23. 'I'm Migration'** (Oil painting on canvas by Alan Rayner, 1999).

*Implicit in the outward forms of migrant birds and animals are travellers' tales of flights and treks, of arrivals, departures and time within motion. The migrants bring with them a cultural heritage that enriches the lives of residents. In its long journey, an English Swallow, dark from above, light from below, swallows landscape. Its travail begins in the elemental South African solar heat that is transformed by photosynthesis into Protea flowers. The heat generates a propelling force that carries the bird over veld, above water-seeking springboks, across deserted sand dunes and dark-light realms of fluttering hoopoes until green-topped, white cliffs signal arrival time before May begins to bloom. Speedwell urges onwards; forget-me-not reminds of home; cowslips reflect the strengthening warmth of rising sun, and terns join in aerobatic arrival celebrations. But where is the welcome for human immigrants?*

Ah yes, where indeed is the welcome for human immigrants? More often than not, in human societies, immigration tends to be regarded more as a problem, even a threat to resident identity, than an opportunity for renewal and diversification. The language we use to describe the spread of human and non-human life is much the same. We speak of migration, dispersal, diaspora, colonization, foraging, establishment, recruitment, settlement, seeking shelter and so on. But somehow the implications of these terms are often perceived as very different when referring to patterns of human spread and relocation, from those of non-human nature.

Could there, then, potentially be a difference between the motivation for human travel and that of non-human life? And how might this difference affect the reception for newcomers in human as distinct from non-human neighbourhood?

I think this potential difference is similar to the one I discussed in an earlier chapter with respect to human and non-human territoriality, and that it can be summarized in one word: *conquest*. When I first showed my father the painting displayed in Figure 19, he grumbled, 'the problem with immigrants is that they tend to take over'. There, in a nutshell, lies the rub - and the source of fearful responses - the invasive potential of the Vampire Archetype, which threatens the sustainability of resident identity. Although the motivation for human movement can, as in my case, be a quest for learning/sharing experience or seeking the shelter of a new home, all too commonly it may be a quest for power - to control and exploit the local neighbourhood, over and beyond drawing sustenance from it. In the modern era an interesting post-colonial inversion of this quest is evident in the tourist industry, which seeks to exploit the sensation-seeking traveller who may be bored and unaware of what his or her own neighbourhood has to offer.

How often do we hear or use language that smacks of the fearful desire to exploit and conquer? Just about anywhere and everywhere, I fear. We speak about conquering just about anything and everything fearful: mountains, oceans, space, disease, communism, capitalism, fear itself - you *name* it. Likewise, we speak of exploiting anything that we perceive as an actual or potential 'resource': plants, animals, fungi, bacteria, viruses, forests, seas, oceans, oil, coal, aquifers, timber... In my own field, it is all too common to justify our investigations into the living world on the basis of how improved knowledge might help us exploit this world to our advantage. I shudder to think how much I have used this language in my own writings.

I suspect that all such language is, a product of the fearful objectification that excommunicates human from non-human, self from other, us from them, here from there and concomitantly empowers the unsustainable imperialism of the Vampire Archetype. This imperialism (notice how I have already 'objectified' this abstract idea, through the need to use descriptive language) seeks not to learn from its explorations and share its experiences, but to impose itself upon and

draw power from the neighbourhood from which it unilaterally declares independence. It seeks not to live within and enrich the diversity it encounters, but rather to reproduce itself at the expense of this diversity. Believing, often sincerely, that its own local knowledge is 'best', it will deny, with missionary zeal, the relevance of local experience elsewhere and seek to replace it.

Such belief can have devastating implications for resident communities, as the history of human colonialism attests and it is not just intentional hostile action that damages. Inadvertent or well-intentioned introduction in one form or another may have equally if not more damaging and longer-lasting implications. Micro-organisms and viruses may be transferred from where they have co-evolved in dynamic contextual balance with their neighbourhood, to previously unexposed populations, engendering disease epidemics. These epidemics may directly affect human beings, as when measles and smallpox were introduced to native Americans. They may also affect their crops and surrounding vegetation, as in the case of such devastating tree diseases as Dutch Elm Disease, White Pine Blister Rust, Chestnut Blight and Jarrah Die-Back. Plants and animals too may be transferred across geographical boundaries that would normally resist and channel their spread. Proverbial rabbits in Australia. Grey Squirrels in Britain. Hottentot Figs sprawling over the sea cliffs of Wales and South West England. Then again it may not just be other forms of life, but other ideas, manufactured products and labels that are introduced: religious fundamentalism, Coca Cola and Nike, for example. Or it may be practices based on limited scientific understanding - as when the principles of European agriculture were introduced into Africa during the nineteenth and twentieth century, taking no account of the prevailing climatic conditions. Again and again, the same old story of contextual ignorance repeats itself, drawing humanity towards the wasteland.

So, I find myself wondering, if humanity were, ever to be given the opportunity to return to Eden, the Garden of Earthly Delight, how might we respond? Might we approach like those vampiric figures depicted in Figure 1, intent on dominion and

arid confrontation, in denial of our dynamic neighbourhood? Could we return joyfully to a natural, inclusional correspondence of one with another in common space? If we could, would we want to stay there, at home with our local neighbourhood? Would the Spirit of Adventure again come calling at our portals, beckoning to a wider world beyond our immediate experience?

### ***On the Road Again - Adventure and Misadventure***

My feeling is that with an inclusional sense of neighbourhood, 'home' is indeed 'where the heart is', our 'centre of gravity'. But this heart is no executive hard-core that wishes to impose itself upon all around. It is a pulsating, receptive-responsive, space-including place that knows no absolute bounds to where its influence begins and ends. It is an open heart that responds to the call of the wild space not with a desire to tame it, but with a willingness to learn to live, love and re-live, inspire and expire, co-creatively within it, as a dynamic inclusion. Its neighbourhood is everywhere.

With this feeling, the spirit of adventure that responds to the call beyond the immediate is by no means lessened. But what prompts the outward-bound journey, and how this journey is navigated, is very different from the motivation to expand dominion. It has no end in sight. It has no need besides what it needs to sustain itself in dynamic relationship with ever-changing circumstances. When it falls by the wayside, it does not regard this as failure, but as the misadventure that can come alongside learning experience. How I wish I could hold on to this feeling in my own life! But in that wish, I suppose, lies the contradiction of trying to live, love and be loved in a human anti-culture that allows no room for feeling space.

## **Something Missing? - The Need for an Inclusional Sense of Gravity**

Before any of us can get very far with our spirit of adventure we have to undertake some rather formidable learning tasks. We have to get off our backs, sides or tummies, learn to crawl, learn to stand up, learn to walk, then run and maybe skate or ride a bicycle before we shut ourselves away again in a motorized shell that we may presume to 'drive'. Strangely, no one can tell us how to accomplish these feats in terms of definitive language or mathematical procedure. If you don't believe me, ask yourself how to ride a bicycle – I think you'll find that the complications of formal description are endless and you still won't actually get anywhere. Yet accomplish them we do, given no more to go on than our bodily senses and encouragement from our neighbourhood. But what senses are we talking about here?

Ask almost anyone to list their senses and sense organs, and out will come the familiar five of sight, sound, touch, taste and smell, accompanied by the eyes, ears, skin, tongue and nose of our outward appearances. All these connect us, in one way or another, with the world of explicit electromagnetic information – what we are inclined to regard as definitive 'reality'. Yet they cannot, either individually or in combination, help us on our way. For that, another sense is required, one that we all too readily overlook or take for granted as it invisibly includes us within the implicit, invisible, gravitational space of everywhere. This is the sense of dynamic balance, given through the semi-circular canals of our inner ears and relative movements of internal organs ('gut feeling') that provides us with an 'inertial guidance mechanism'. Combined with our explicit senses it provides the facility known as 'proprioception' – an inclusional awareness of 'self in space' as a complex identity of local within non-local. We can thereby align our receptive 'centre of gravity' with the universal gravitational pool through the responsive configuration of our dynamic bodily boundaries. Without this gravitational sense, we literally do fall by the wayside. Yet if we try to do without it and objectively analyse the 'world out there', detached from our personal feeling, as many of us

seem to do for much of our lives, something vital is lost from our appreciation of our situation.

### ***Getting Into and Out Of 'Power Wobbles'***

My friend, Ted Lumley, describes an experience in which he was riding downhill on his motorcycle. Distracted by the thrill of the moment he allowed his speed to exceed 90 mph, only to find that the beast he had unwittingly unleashed in his machine would no longer respond to efforts to impose control. As he applied brakes and attempted to steer in the 'right' direction prescribed by his eyesight, the motorcycle became a bucking bronco, what chaos theorists describe as a 'strange attractor' with very unpredictable, non-linear dynamics. He saw death approaching round the next bend in the road and relinquished all efforts to impose control. He began to play in a sense of self-abandonment with the steering, throttle and brakes.....and continued his journey.

I feel that there is an important 'object lesson' in this experience of what Ted calls a 'power-wobble'. When the imposition of power upon what we may perceive as a performing object that we are in control of becomes too strong, the underlying flow-form has a way of making itself felt. That from which we have dislocated ourselves in order to enforce wilful direction upon it threatens in turn to dislocate us as our centres of gravity come apart. If we are not thereby to fall by the wayside there is no thing else for it - we have to let go of our prescriptive intentions and attune with our dynamic contextual circumstances, however 'right' or 'wrong' we might judge them to be.

### ***The Power of Attunement***

Here, once again, is where I feel we can learn so much about what sustainability really implies, from an inclusional biological understanding of living systems. The ability of these systems, as fluid dynamic breathing spaces with a complex self-identity, to attune inner with outer circumstances is perhaps their most abiding characteristic. Such attunement is achieved through varying the deformability, permeability and continuity of their dynamic bodily boundaries, and associated degree of reception and response between inner and outer domains, as appropriate to circumstances. It involves far more than the simple 'adaptation' of 'one' to a fixed 'other', which is the basis for one-sided neo-Darwinian evolutionary thinking, because both domains are dynamic and under one another's influence. Under conditions of external plenty the permeability and deformability of boundaries increases to maximize uptake and growth. Under conditions of external limitation, processes of boundary sealing, fusion and redistribution occur to minimize losses from, and enhance internal communication within, exploratory and energy-conserving structures. So wheel life cycles on.

### ***Serendipity – The End of the Rainbow That Is Always Opening***

I have earlier described 'falling by the wayside' as a potential 'misadventure' in the inclusional exploration of life. But, of course, that is only one possibility and it has a very different counterpart - the 'happy accident' known as 'serendipity'. Such happy accident, where we stumble upon some finding that we could not have defined in advance, has a pivotal place both in our individual and collective human life histories. No doubt it also has a prominent place in the history of biological evolution on Earth. Without it, no radical transformation in our way or understanding of life is possible; we can only remain stuck in a rut. To benefit from it, in the long run all that is necessary is to journey in receptive-responsive mode, alert to the possibility of new vistas opening beyond immediate experience and distant objectives. In other words, as any Boy Scout might venture, to 'be



prepared'. On the other hand, to journey with eyes fixed on a destination is to miss out entirely on the future that is dynamically included in the present, one for which there is no time frame save that of continual contextual transformation.

On the night of my stress leave in 1999, I dreamt of an aged, wiry-framed, wiry-handed African, the soloist in an orchestra playing an instrument made of rough, cobbled together pieces of waste wood and wire. The sounds he produces are beautiful and harp-like. In the middle of the piece, part of the instrument comes apart. He calmly acknowledges the situation and lovingly asks the audience to wait whilst he repairs the instrument. A short while later, I painted the picture shown in Figure 24.



**Figure 24. 'Plain Brotherhood'** (Oil painting on board by Alan Rayner, 1999). *Silver and gold strands of rain and sunlight are strung, harp-wise, from the sinewy, strong legs to bass clef wing plumes of a male ostrich with negligee of black belly feathers. Black-backed, pink-palmed, male hands, modelled on my hands, emerge like primary feathers from white coverts and fiery secondary feathers in the wings of crowned cranes, mutually supporting each other's one-legged stance. The hands stretch out to pluck the harp strings. Wet season gives way to dry, across a sinuous path on which two warriors stand one-legged, spear-supported to left or right, vigilant yet content and open-handed in the generosity of their unconditional love. Swallowtail butterflies link darkness and light from giraffes to zebras. Acacias transform stems to leaves. An egg cracks open, perpendicular to the hatching plane to reveal – what? This is where I came from.*

And so I have arrived where I started.